South Pacific Enterprise

The Colonial Sugar Refining Company Limited

SOUTH PACIFIC

showing location of Company's activities

- Head Office
- Branch Office
- Building Materials Sales Office
- Sugar Refinery
- Raw Sugar Mill
- Distillery
- Building Materials Factory
- Asbestos, Gypsum mine
- Chemical Factory
- Research Laboratories
- Agricultural Experiment Station
- Engineering Workshop
- Training Farm for Fijians
- Cattle Station
- Ships

0
200
500
1000
1500

SOUTH PACIFIC ENTERPRISE

THE COLONIAL SUGAR REFINING COMPANY LIMITED

SIR EDWARD KNOX

From a daguerreotype taken in 1854 when he was 35 years of age.
(Public Library of New South Wales.)

SOUTH PACIFIC ENTERPRISE

THE COLONIAL SUGAR REFINING COMPANY LIMITED

ANGUS AND ROBERTSON

SYDNEY LONDON MELBOURNE WELLINGTON

First Published 1956

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ACKNOWLEDGMENTS

The company wishes to thank all those who have helped in the writing and production of this book, and in Appendix 1 has acknowledged the the assistance of many individuals and organizations.

EXPLANATORY NOTES

Explanatory notes of some terms used in this book and a brief list of the activities of C.S.R. appear as Appendices 2 and 3.

EDITOR'S PREFACE

This book is a landmark in the history of the Colonial Sugar Refining Company. It is the first major attempt to tell the story of its activities, its position in the sugar industries of the South Pacific and the policies which have determined its organization and expansion. In some ways the book must be a story of the sugar industry as a whole, for although C.S.R. is only a part its activities are closely interwoven in the whole fabric of the industry.

This is a company which at some stages in its history attracted much political fire, as was inevitable in the climate of Australian politics, where bigness and success are enough to arouse suspicion. Today the company's relations with other parts of the sugar industry are probably better than ever before and the reports of successive Royal Commissions and Committees of Inquiry on the Sugar Industry have not provided material for critical attacks—indeed have generally been favourable to the industry and to the company. This book attempts to describe, to a wider public than reads official reports, the role of C.S.R. in the South Pacific, and to deal with subjects that have not been the concern of official inquiries.

It is significant that the book is not primarily a history, although this would have been appropriate for the centenary of Australia's oldest large-scale manufacturing company. The historical chapter gives only the broadest picture of the growth of the sugar industry, of a few of the individuals who pioneered the industry and moulded C.S.R. and of the forces which produced the present organization and structure of the sugar industries of the South Pacific.

It is no small task to present a complete picture of a company with such wide and considerable interests and of an industry which is so complex in its structure. Decisions had to be made about the kinds of readers to whom the book should be addressed. One large group comprises the proprietors and they are very diverse, as the analysis of shareholders' occupations, given in the chapter on ownership, clearly shows. The employees are an important group, for few of them could have a complete grasp of all the company's activities and relations described in this book. Finally, while it was necessary to offer solid fare to the experts, the basic intention was to communicate with intelligent and serious-minded people who, although possessing scant

knowledge of sugar and of the company's other activities, are interested in the wider question of how the growth and practices of a prominent corporation are related to the economic, social and political developments in our communities.

Such considerations have resulted in the production of a book which, though not intended as light reading, is not as technical and comprehensive as the specialists might wish. There had to be some compromise in the selection of material and, as editor, I must accept considerable responsibility for this. It would have required at least another volume to cover fully such things as the events which led to the present system of government acquisition of the whole of Australia's raw sugar production and the complex structure of the industry today. The battle for markets and the negotiation of agreements overseas could be described only briefly. Some of the account of technical developments in growing, milling and refining had to be curtailed. Many individuals have not been mentioned although they made significant contributions to the industry and to the company. I had to recommend the exclusion of nearly all personalities of the last thirty years or so; the editor and the historian of the sesquicentenary publication must make amends.

The book is a group effort, written largely by men whose trade is executive action and thinking rather than writing. This had to be so, for no man within the company could adequately cover every subject and no man outside it could have acquired the complete background and facts within a reasonable period. As editor I have tried to maintain cohesion and sequence and to introduce the writers and their contributions by a short preamble to each chapter. Inevitably, in these circumstances, there has been some degree of repetition but this was largely intentional to cater for those who would read only the chapters of special interest to them. I hope that those who read from cover to cover will understand.

The company did its best to ensure that contributors outside the organization had every opportunity to gain a complete picture and not only the point of view of C.S.R. Dr Alan Birch spent much time over a period of more than a year in tracing documentary material in the company's records and in libraries, and in interviewing people of long experience and knowledge of the industry. Mr H. W. Herbert spent several weeks making inquiries throughout the sugar cane areas of Australia, meeting farmers, inspecting mills and refineries, and talking with leaders of the various associations and boards in the industry. A long time was spent in sifting evidence, cross checking information and ideas, and comparing results with official reports

which are plentiful and searching, before final conclusions and judgments were arrived at. Mr Clive Turnbull visited all the new factories and the distilleries, talked with managers and staff and was given access to any material he required.

Before writing the section on Fiji I spent three weeks in the islands seeing all phases of the industry and talked freely with all groups associated with it—with senior officers of the colonial administration, members of the Fiji Legislative Council, Indian and Fijian farmers, trade union leaders, and workers and staff in the sugar mills. I also had discussions with many leaders of the various organizations connected with the industry in Australia. The company provided voluminous reference material. At times I could have used a sugar bag to carry the masses of documents and special memos handed to me for study and comment.

Mr John Wilkes read all the manuscripts, edited them in detail and prepared them in final form for the publisher.

Confidential information was readily made available when I wished to verify a point. The complete frankness and helpfulness extended to contributors like myself, who had no previous contact with the company, were important in creating a feeling that this was a worthwhile task. This developed into a realization that the book could have a significance extending beyond the interests of C.S.R. To all of us, including many busy officers of the company, I felt that this was important in carrying us onward when the project grew into something much bigger than was originally planned.

At various stages in the preparation of the book decisions were made to deal more comprehensively with certain matters and to include some additional sections and chapters. This accounted for delay in publication. It also meant that some chapters had been substantially completed more than twelve months before others and, in this period, many changes had taken place. To avoid further delay, however, it was decided not to revise the whole book. This preface was first written in September 1955 when the book appeared to be nearing completion and, in the main, Chapters 1 to 11 are based on the situation at that time, as also are the statistics in most of the appendices. Chapters 12 and 13 were completed in March 1956 and Chapter 15 in July 1956. All chapters carry the date of writing.

While opinions are those of the writers the company accepts responsibility for all statements of fact. The degree of checking and cross-checking has been formidable, with a score of senior officers making contributions which cannot be acknowledged in detail.

The main effort in compiling the book was made by two officers of the company, Mr J. M. Dixon and Mr J. F. Blaxland. On behalf of those whose names appear at the heads of chapters, I thank all who generously and courteously assisted us.

A. G. LOWNDES

SYDNEY

August 1956

Mr A. G. LOWNDES was engaged by the Colonial Sugar Refining Company Limited to write Chapter 4 on Fiji as an independent person with experience in agriculture and economics. Shortly afterwards he was recommended to the company by Angus and Robertson Limited as editor for the publication, and he agreed to act in that capacity.

Mr Lowndes obtained his M.Sc. degree at the University of Sydney and studied agricultural economics at Cambridge. His background includes teaching, travel, the army, UNRRA and management. He is the author of a geography textbook, is an occasional contributor to contemporary journals, and has been chairman of the Australian Institute of Political Science for the past five years. He has been in private consulting practice since 1954, and has recently been appointed a member of the Australian Broadcasting Commission.

SIR EDWARD RITCHIE KNOX

From an oil painting by Mr Henry Hanke, 1955.

INTRODUCTION

This book is designed to mark a centenary and to describe The Colonial Sugar Refining Company Limited as it is today. Our objects are to communicate an understanding of the nature of the company, how it works, and the role it plays in the communities of the South Pacific. Our plan has been to present evidence and to let readers draw their own conclusions. We are not organized for book-writing and our skills do not lie in that direction, but we have assembled much information from which a coherent picture of the company does, we hope, emerge.

The growth and development of the company up to about the first world war are described briefly in the historical chapter of this book. It covers the periods of Edward Knox, my grandfather, who founded the company, and of E. W. Knox, my uncle, who was chief executive for about half a century from 1880. These two men, above all others, built and shaped the company. It is a larger and more complex organization today, in a larger and more complex environment, but we still owe to them a number of good traditions of personal and corporate behaviour which have helped us greatly. They were men of integrity who worked hard, accepted responsibility, counted costs and respected persons. Their influence gave a continuing background of character and pointed policies and practices in a positive direction. Against that background fresh ideas, new attitudes and changed policies have emerged to meet changes within the company and in the environment in which it operates. It is difficult to set down in words the nature of these ideas and the standards to which we try to work. Indeed we rarely find it necessary or desirable to reduce them to words ourselves. In part they form a kind of inherited outlook, or attitudes like those inculcated by family upbringing. However some of them are consciously evolved and change as problems and circumstances change. But the process of thinking out and policy-making which must precede and accompany action is rarely a backward-looking activity. The day-by-day worries, thoughts and plans of our board and management are concerned with the practical problems of the present and the future. It is on occasions such as this that one pauses to consider how much one does indeed owe to the past.

It is perhaps in attitudes towards our work that there has been least

change. Our main job has always been to produce sugar, one of the staple foodstuffs of the modern world, and to produce it under the incentive of profit for the owners of the business. Edward and E. W. Knox never doubted that they were performing useful social functions, and their attitudes permeated the company's places of business. Today we produce building materials and chemicals in addition to sugar, and the consciousness that we are doing something useful remains. The provision of food, shelter and basic chemicals seems to us to be socially worthwhile.

We endeavour to show in parts of this book how the present grew out of the past but most of the text deals with us as we are now, after 100 years of growth and change: growth and change because we are a capitalist enterprise and capitalism is a social device which changes with changes in the society of which it forms a component part and which it serves. And social devices, whether they be forms of government, capitalism, trade unionism, codes of law, are not ends in themselves but means to ends. It seems to me that their final justification depends largely on their effectiveness in advancing what we broadly refer to as civilization, both in the material and non-material aspects. To promote civilization, I take it that any individual or human institution should respect the vision, manners, and material welfare of the individual man—and contribute to at least one of them.

It is difficult to judge contributions to the advancement of non-material ends, because most men have their own individual and personal opinions about such abstract matters and they assign varying importances to them. Moreover, the social aims of one generation often differ from those of the next—they have indeed changed quite a lot in my lifetime. The book will show that the kind of people who own the company and the kind who administer it represent, in the main, a cross-section of what is generally called the middle class of the community; as such they are aware of values other than material and are actuated by motives other than the purely economic—and are conscious, too, of evolution in opinion.

Motives and opinions are difficult to evaluate. There is, for instance, an honoured intellectual tradition which has been expressed as "the irrelevance of material welfare as a criterion of progress". But the political democracies in which we operate appear to set only limited store by it, and to set high store by material welfare, even as an end in itself. And it seems to me that status as a nation and even the ability to survive as a people in a competitive world, the provision of leisure, education and social services, as well as opportunities for scholastic

and artistic endeavour, all rest heavily upon high economic productivity. Little of civilization as we know it, with its widespread distribution throughout the community, has been found amongst economically backward communities. The capitalist system of industrial production has proved itself a most efficient social device for increasing productivity and material welfare. And, despite shortcomings in some directions, I believe the private enterprise system is fundamentally more respectful of individual personality, freedom and aspirations than a collectivist system can be.

Although our communities set high store by increasing material welfare it has been remarked that economic and political policy, for some fifty years, has given much attention to the division sums—questions affecting the distribution of material welfare; and far less to the multiplication sums—the production of increasing material welfare. In practice, if not in theory, it is often overlooked that, if multiplication has taken place, the final quotients obtained from the division sums are much larger. The uneven material progress of many nations today and the centuries of very slow progress prior to the industrial revolution indicate that the multiplication process cannot be assumed to be automatic; they indicate that it needs the continuous husbanding care of deeply interested human hands and brains, the constant feeding with physical resources held back from consumption, and that continuing forward momentum which depends so much on human enthusiasm and optimism: all of which can be stimulated by material and non-material rewards and conditioned by the direct and indirect disciplines found in our communities.

Also it has been wisely said that human beings produce their best results when working in "an atmosphere of approval"—not unearned approval, not an atmosphere devoid of suggestion, of reasoned factual criticism, or of discipline; but one where recognition is freely given and approval, if merited, not withheld. For those who agree that there is importance in this concept, there is room for thought about the effect of continuing broad atmospheres of approval or disapproval on the long-term efficiency and value to society of business organizations, which are essentially human institutions.

While it is not difficult to obtain a view of the company's contributions, at least on the economic side, and while statisticians may be able to measure economic progress by mathematical means, the actual making of the progress is no mere mathematical process. The blend of physical and human resources that make for economic advancement via profit-making institutions such as we are, is one of the main themes in this book, although it is my hope that, in stressing

this, we have not obscured the evidence on contributions beyond the economic sphere.

Business employs many methods and some formulae, but no overall formula, and attempts to generalize about it can be misleading. Intuition and judgment play their part, as well as carefully calculated sums. Risks and the partly intuitive decisions which we have to make are not reducible to formulae; nor are many of the human factors met with in business. While business does have its excitements, its victories and its defeats, its approach is, in great part, careful, economizing, sometimes humdrum—and it always tries to count the cost. Much of it is composed of a mass of intermeshed detail that is not readily intelligible, even if made known to the outsider. It is no easy matter to write about business with insight and sufficient simplicity to hold the reader's attention, yet remain accurate and avoid oversimplification of what is essentially complex and many-valued.

Except for the historical chapter, and in some respects the chapter on the rewards obtained from the enterprise, the book deals with the company as it is at the present time, with only occasional glances back to the past to explain or to illuminate the present. The period between the two wars is too close to write about as history or to view in perspective. But the twenties and thirties were important years for C.S.R. It was a period during which steady growth and development took place, and a period of evolution in forms of direction and management. About 1930 the conviction grew stronger that there was little scope for expansion of raw sugar production in Australia and Fiji. Some increase in the level of production was still possible at that time, but only by acceptance of a very low price. Our refineries, also, were producing to the capacity of available markets. As this situation meant that continued expansion of the company's existing major activities was substantially blocked, our thoughts turned to other ways of developing the business. The general manager Mr P. H. M. Goldfinch (he became Sir Philip in 1934) with the backing of the board made exploratory inquiries directed towards expansion into other fields.

The company was broad-based inside sugar, being in three countries and in both milling and refining. We had substantial liquid capital resources, in excess of the amount required for the sugar business, and we could not foresee the war and the high inflation which would follow and become a heavy consumer of financial resources.

With Sir Philip Goldfinch, a "sugar man", brought up in his earlier business life in the mills and possessed of great drive and enthusiasm, the lines of thought were: sugar in other parts of the world, or buying

an additional part of the Australian industry; any other profitable industry in Fiji which would broaden the base of the economy of that colony and therefore be good for the company and the colony; further development of by-products of sugar, or allied products.

We carefully considered the purchase of further Australian sugar mills and decided against it. Officers of the company, including men from Fiji who understood Indians, visited India, but on receiving their report our decision was not to enter into the sugar industry in India. Cursory thought was given to sugar in East Africa.

In 1936 we started the growing and canning of pineapples in Fiji. This venture was long persevered with, in a constant endeavour to make it a success, but in 1955 we reluctantly decided to close it.

The first major factory of our Building Materials Division commenced production of cane-fibre wallboards in 1939. This division has been steadily expanded since then. In the same year we acquired a part-interest in a company manufacturing industrial solvents in Sydney; this was the seed from which grew our Industrial Chemicals Division, which was developed in postwar years and has now become part of C.S.R. Chemicals Pty. Ltd., of which the Distillers Company Ltd., of the United Kingdom, owns 40 per cent.

Naturally, proposals for new developments of many kinds are frequently put before us. Some of these are briefly examined, others more thoroughly. A number of possible developments arise from inside our own organization. At the present time there is, temporarily, a lot to do to consolidate the recent expansion in milling, refining and bulk handling of raw sugar, and in building materials and chemicals. In business, as in war, the principle holds of the concentration of force on the most important objectives—priorities have to be established.

In 1940 Sir Philip Goldfinch was given leave to accept the invitation of the Commonwealth Government to become chairman of the N.S.W. Board of Area Management, Ministry of Munitions, a part of the great organization being built up under that production genius, Mr Essington Lewis of the Broken Hill Proprietary Co. Ltd. Sir Philip served in that capacity with characteristic drive and to the detriment of his health until he died, suddenly, in 1943, while still occupying the position. Mr C. W. Rothe became acting general manager in 1940, when Sir Philip went to the Ministry of Munitions, and general manager on Sir Philip's death.

During the war sugar was important and its production was accorded fairly high priority by the Federal Government. It was rationed for home consumption so that more would be available for Britain and the allies. Industrial alcohol and building materials had high priorities.

All the remaining human, technical and productive resources that we could organize went into specific wartime tasks as desired by government. A high proportion of the younger men went into the services and other men were loaned for various periods to government departments, particularly the Ministry of Munitions.

Difficult problems arose in Fiji during the war and Mr Rothe and Dr Harman had the most direct responsibility for handling the situation. They set in motion in Fiji the policy of much freer discussion with growers, employees and government. In the postwar period steps were taken to develop the Building Materials Division, for which the chief architect was Mr C. W. R. Powell; and to launch the development in industrial chemicals.

Towards the close of Mr Rothe's managership, increased and more remunerative raw sugar markets were obtained overseas, and capacities of a number of our mills were increased to take advantage of the improved market position. Expanded settlement and population in Queensland and Fiji were greatly assisted by these developments. In 1951 Mr Rothe retired and Dr R. W. Harman was appointed general manager.

The centenary of the C.S.R. Company finds us a large company, with a considerable forward momentum; and, because we have confidence in the long term about the people who inhabit and who will develop the South Pacific countries, and confidence also in our staff, the company is possessed of optimism about the future. I refer to the *company's* optimism because it is nowadays appropriate to refer to companies of our type in that way. They acquire a "personality" of their own and can no longer be interpreted by reference to one man.

To our proprietors, the shareholders, I would say that although the majority of you have held our shares for a long time, I hope you will learn from this book even more about the organization and the business, of the problems met with, of the way we tackle them, of the standards we work to, and how we intend to continue—for you have entrusted us with the direction of all these matters on your behalf.

To the staff, some of whom are second and third generation C.S.R. men, I express the hope that you will find the book does the company, including yourselves, just credit. The carriage of proceedings is in practice much in your hands and what the chairman said to the general meeting of shareholders when the company was fifty years old can be repeated today: "it is to that [administrative] staff that all businesses look for their well-being". In this book it has not been possible to describe the work of all sections of our employees; some sections, some

activities, some individual functions, had to be brought more to the fore than others, and they should be taken as illustrative of the whole.

To sugar industry people and to people connected with our other industries, I would lay some emphasis on the point that this is, first and foremost, a book about a joint stock capitalist enterprise, a corporation, an organization of men—both owners and operators. While information is given about sugar and the sugar industries, it is not a book about sugar. We have tried to explain where we fit into those industries and the contributions we have made to them; but the occasion calls for the spotlight on the company rather than on the industries of which it is a part.

It is fitting that I should close this introduction by thanking all those, both inside and outside the company, who have helped in the writing and publication of the book. Some of the writers are members of our staff. The others have no ties whatever with us. Mr Lowndes, occupying the difficult position of editor of a symposium which was planned to finish as an integrated book, Dr Birch, Mr Herbert and Mr Turnbull knew very little about C.S.R. until they began the preparation and inquiry that formed the basis of what they have written. Their contributions have made many parts of the book more objective and more readable, and we thank them for their help.

E. R. KNOX

1 O'CONNELL STREET
SYDNEY

February 1956

CHAPTER 1

Sugar and the Sugar Cane Plant

The environment required for the growth of the sugar cane plant determines the location of the primary producing part of the industry and of the mills which extract raw sugar from the cane. The plant's characteristics and its methods of producing and storing sugar have a dominating effect on the agricultural methods, on the transport systems from field to mill and on the engineering and chemical processes used in the mills to win the sugar. About 60 per cent of the Australian retail price is represented by growing and milling, the costs of which are closely related to the nature of the cane plant.

Before dealing with the role of the Colonial Sugar Refining Company in the sugar industries of the South Pacific it is desirable to convey some understanding of the basic facts about sugar and the sugar cane plant. This short chapter, written jointly by a group of C.S.R. officers, therefore provides a very general background to the chapters which follow.

September 1955

PREHISTORIC man indulged his appetite for sugar, even if he was seldom able to satisfy it, by eating sweet fruits and honey. In the South Pacific, including Fiji but not the Australian continent, he had a more continuous and reliable source—chewing and sucking sugar cane; for sugar cane is indigenous to the islands of the South Pacific. It is thought to have originated in these islands and probably also in the southern parts of Asia. In slow and halting steps, over long ages, sugar from cane came into prominence, but it did not become known to Europeans until historic times.

Sugar cane was well known in India for perhaps a thousand years before Christ. The soldiers of the great Macedonian conqueror, Alexander, did not know sugar in their Mediterranean homeland but they are believed to have been the first Europeans to see sugar cane. When Alexander's conquests took his armies to India about 327 B.C. they saw cane growing and called it "a reed yielding honey without bees".

Slowly, and in minute quantities, sugar from cane—but not as yet the cane plant itself—travelled towards the Near East, as an article of luxury, via the trade routes, by caravan over deserts and mountains and by primitive coastal sailing dhow.

The main impetus westward came with the great Islamic conquests when, about the seventh century A.D., the Arabs brought the plant, sugar cane, from the Tigris and Euphrates in Persia to the Mediterranean countries. Sugar became known in England only 500 to 600 years ago, being imported from the Mediterranean countries. The Venetians became great sugar refiners and merchants, processing it into conical "loaves" for keeping purposes, transport and sale.

Columbus, on his second voyage, took sugar cane to the Caribbean where it flourished to such an extent that the area came later to be described as the "sugar bowl" of the world.

It is recorded that sugar cane was taken aboard the First Fleet at the Cape of Good Hope, en route to Botany Bay. This cane was presumably taken to Norfolk Island, for in 1788 Lieutenant Philip Gidley King, commandant of the island, reported to Governor Phillip, "The sugar cane thrives very well". It is not known what happened to the canes at Norfolk Island. No cane was apparently grown on the Australian mainland until Thomas Alison Scott introduced it from Tahiti in the Society Islands in 1817.

The chemical name for ordinary household sugar is *sucrose*. It is one of the commonest of the sugars produced by nature and is found in varying quantities in many grasses, some vegetables and a few trees, such as the Canadian sugar maple and some palms.

Honey, made by the bees from the nectar of flowers, consists mainly

of two un-crystallized sugars known as glucose and fructose; nectar contains these sugars, together with a considerable proportion of sucrose which the bees convert to glucose and fructose.

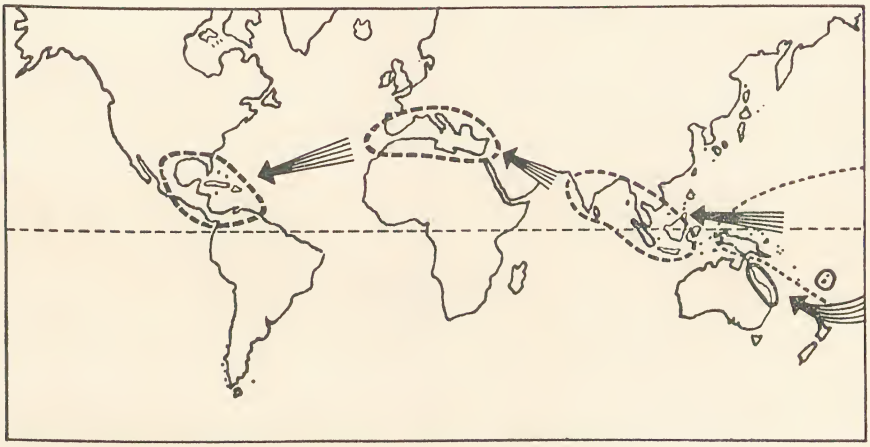
The synthetic sweetener, saccharin, is a derivative of coal tar. It is not a sugar and it has no food value.

Nature's sugar factory is the green leaf; her storehouse is the stalk, root or fruit, where the sugar is held until required for future growth or as sustenance for the next plant generation.

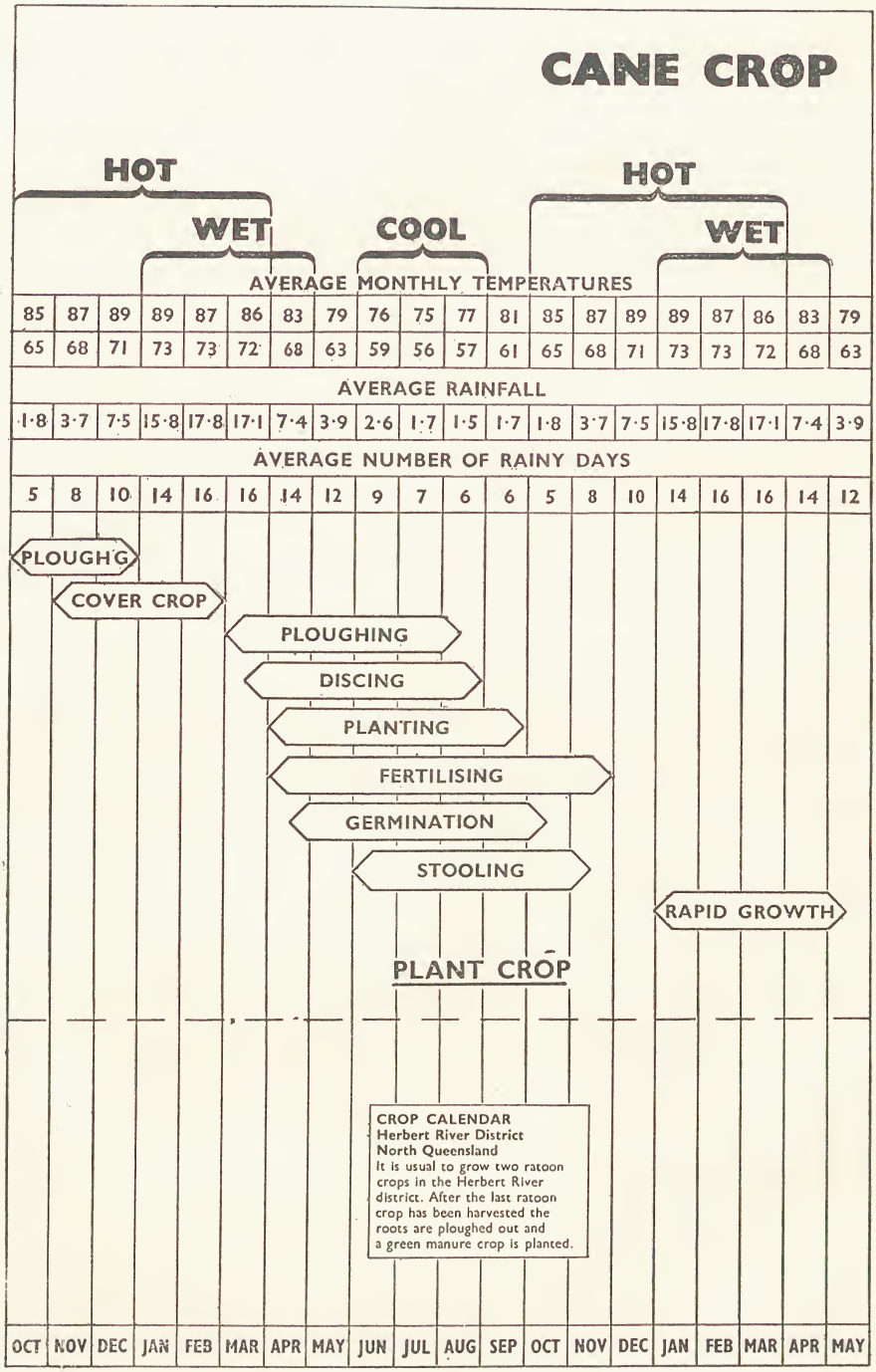
In the green leaf, with the energy from sunlight, sucrose is formed. Thus arises the description "crystallized sunlight". The sun's rays acting on the chlorophyll, or green colouring matter in the leaf, cause carbon dioxide (CO_2) from the air to combine with water (H_2O) to form sucrose, the chemical formula for which is $C_{12}H_{22}O_{11}$. This is the process called "photosynthesis" whose mysteries are still not fully understood.

All sugars, and also the starches which are most commonly eaten as bread and potatoes, are called carbohydrates and have similar chemical formulae. They consist of the chemical element *carbon* combined with the elements *hydrogen* and *oxygen*. The last two are always present in the ratio of two atoms of hydrogen to one of oxygen, as in water; hence the name *carbohydrate*. Carbohydrates comprise one of the most important groups of food for man and animals.

Chemists know many sugars besides sucrose, but sucrose is completely dominant as a foodstuff. Its commercial sources are the sugar cane and the sugar beet and, to a very minor extent, the maple tree. World production of sucrose is about 40 million tons, of which 63 per cent is



The main path of the movement of sugar cane since prehistoric times. It is believed to have originated in the islands of the South Pacific and probably also in southern Asia—but not in Australia, to which it was probably introduced from Tahiti by T. A. Scott in 1817.


CANE CROP
HOT
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65 68 71 73 73 72 68 63 59 56 57 61 65 68 71 73 73 72 68 63
AVERAGE RAINFALL
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AVERAGE NUMBER OF RAINY DAYS
5 8 10 14 16 16 14 12 9 7 6 6 5 8 10 14 16 16 14 12
PLOUGHING
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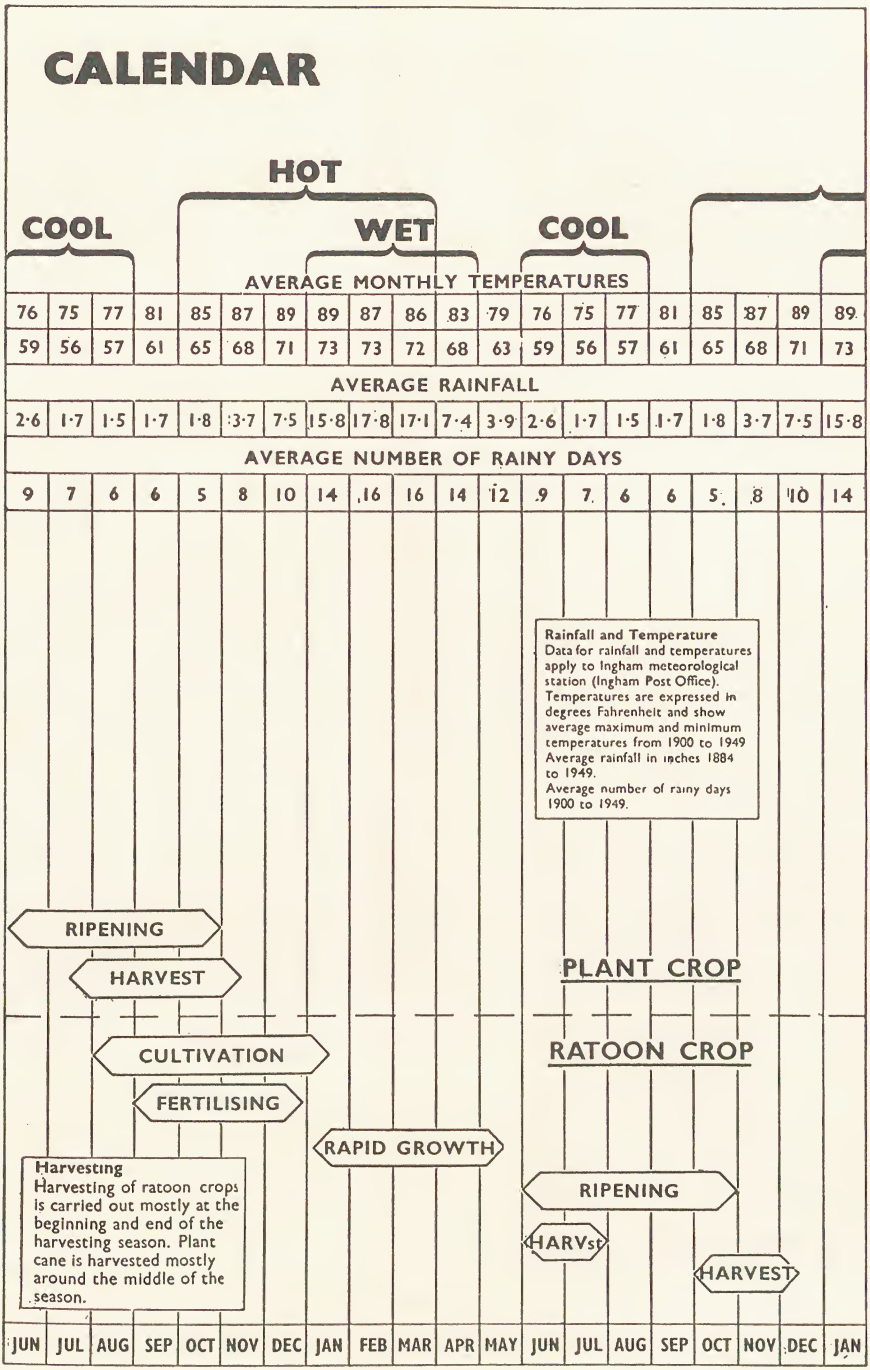
GERMINATION
STOOLING
RAPID GROWTH
PLANT CROP
CROP CALENDAR
Herbert River District
North Queensland
It is usual to grow two ratoon crops in the Herbert River district. After the last ratoon crop has been harvested the roots are ploughed out and a green manure crop is planted.
OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY

CALENDAR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59 56 57 61 65 68 71 73 73 72 68 63 59 56 57 61 65 68 71 73
AVERAGE RAINFALL
2·6 1·7 1·5 1·7 1·8 3·7 7·5 15·8 17·8 17·1 7·4 3·9 2·6 1·7 1·5 1·7 1·8 3·7 7·5 15·8
AVERAGE NUMBER OF RAINY DAYS
9 7 6 6 5 8 10 14 16 16 14 12 9 7 6 6 5 8 10 14
Rainfall and Temperature
Data for rainfall and temperatures apply to Ingham meteorological station (Ingham Post Office). Temperatures are expressed in degrees Fahrenheit and show average maximum and minimum temperatures from 1900 to 1949 Average rainfall in inches 1884 to 1949.
Average number of rainy days 1900 to 1949.
RIPENING
HARVEST
PLANT CROP
CULTIVATION
RATOON CROP
FERTILISING
RAPID GROWTH
Harvesting
Harvesting of ratoon crops is carried out mostly at the beginning and end of the harvesting season. Plant cane is harvested mostly around the middle of the season.
RIPENING
HARVEST
HARVEST
JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN

cane sugar. The sugar beet grows in cool to cold temperate zones, and is an internal source of sugar important to many countries in Europe and in North America. There used to be a beet sugar factory in Victoria but the industry proved uneconomic and has disappeared.

The largest cane sugar producing country is Cuba which makes about 4,500,000 tons each year. Australia, with about 1,150,000 tons, at present ranks fourth or fifth and Fiji in a normal season makes about 180,000 tons.

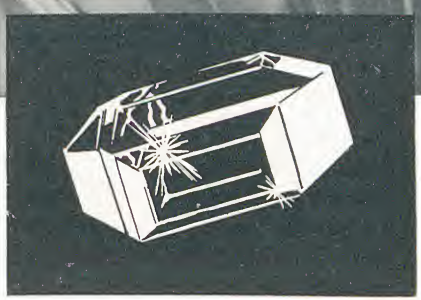
The Cane Plant

The sugar cane plant is nature's most efficient sucrose factory, producing more sugar to the acre than beet. The sugar is formed in the leaf and stored in the heavy, thick stalk. Commercially grown sugar cane looks something like bamboo, with regularly spaced joints or nodes, but is heavy and solid—not light and hollow like bamboo. It is one of the true grasses, of the genus *Saccharum.* Normally it reaches a height of 10 to 14 feet and grows in a clump. The whole clump forms one cane plant and is called a stool. Thick-stalked commercial varieties, from $1\frac{1}{2}$ to 2 inches in diameter, generally contain five to eight stalks to a stool, but some thinner-stalked types, with a higher proportion of "wild" blood in their breeding, produce up to fifteen stalks. Most of the side leaves die and fall off as the plant grows, but there is always a green top to each stalk, consisting of graceful, waving leaves up to 4 feet long.

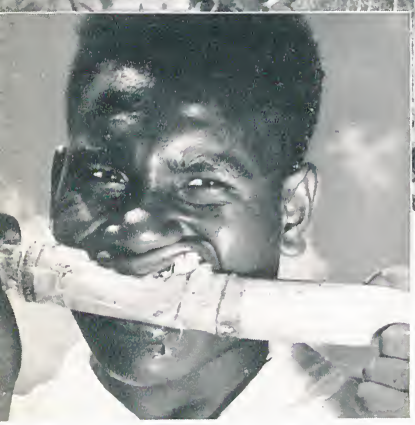
The crop usually grows for twelve to eighteen months before it is harvested. From the roots left in the ground after harvesting, a new generation of stalks will grow. This is called a *ratoon* crop. Good ratooning characteristics are most important because a ratoon crop means another harvest without the heavy expense of ploughing out the old stools and roots, cultivating and replanting. However, ratoon crops give successively less vigorous growth and lower yields to the acre, until ploughing out and replanting become necessary to ensure economic operations.

The cane plant has the typical flower of the grass family, on a grand scale. The general appearance is of a grey or purplish-smoky, feathery plume up to 4 feet long and a field in full flower waving and rustling in the breeze is a beautiful and unique scene. In favourable climatic conditions, viable seed is set by many varieties; seed is the essential vehicle for breeding new varieties but is of no direct interest to the cane farmer. He plants his new crop by placing foot-long cuttings of the stalk, known as "setts", flat in a furrow and covering over with two or three inches of soil.

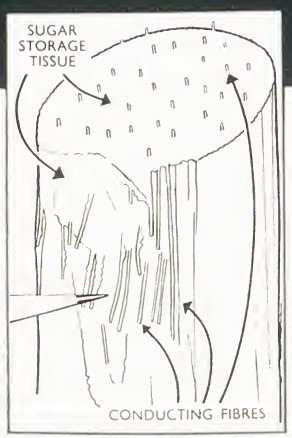
Sugar is made in the green leaves of plants. Through the action of the sun's rays carbon dioxide from the air and water from the soil combine to form sucrose—the chemical name for sugar.



The granulated sugar of the grocery trade and the breakfast table consists of crystals of sucrose—the sugar made by photosynthesis in the leaves of cane and beet plants.



Sugar cane is indigenous to the South Pacific Islands where many islanders grow it as a sweet vegetable which they chew. The cane above was photographed on the northern slopes of the Hydrographers Range, Papua, by a C.S.R. cane collecting expedition in 1914. Native gardeners sometimes grow their cane for 3 or 4 years, supporting it with poles. Sweet New Guinea canes have provided breeding stock for many varieties now grown commercially in Australia and Fiji.

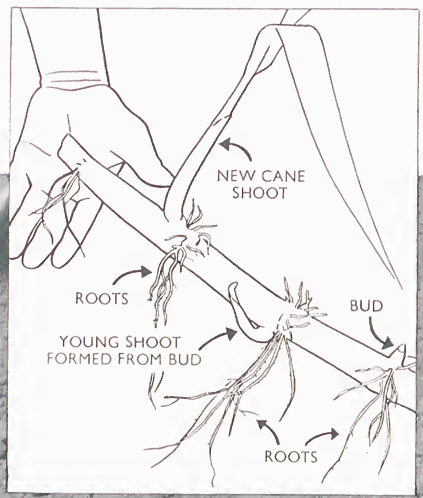


This piece of cane has been cut across the grain to show the long, hard, conducting fibres and the soft storage tissue. The pencil is pointing to several fibres which have been broken off by gouging a piece out of the side of the cane.

The long thin fibres are conducting vessels. Inside each fibre are two channels. One channel takes water from the soil to the leaves of the cane plant, and the other channel brings sugar solution from the leaves, where the sugar is made, to the stalk where it is stored.

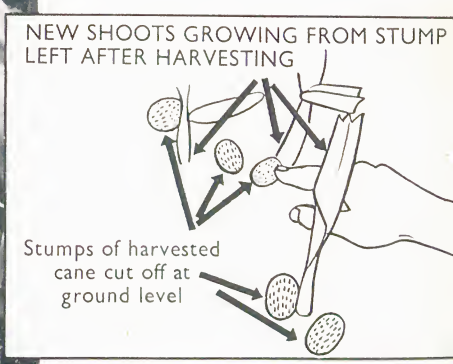
Cane is propagated by means of short pieces of "seed" cane, or setts, about a foot long. The eyes, or buds, at the joints, or nodes, will begin to grow when the sett is planted.

Roots and shoots grow out of the cane at the nodes. A number of stalks will grow from one piece of seed cane. The soil in the furrow has been scraped away to show the growth of roots and shoots.



Cane farmer cleaning side leaves off stalks before cutting them up as seed cane. Crop of maturing cane in back ground.

When the mature cane is cut off from the base new shoots grow from the stump left in the ground. The cane is said to "ratoon" and the new crop is called a *ratoon* crop.



THE SUGAR CANE PLANT

Sugar cane is a giant member of the grass family. A clump or stool of cane consists of a number of stalks 6 to 10 feet long with leafy tops. Cane is not hollow like bamboo; the sugar is stored as a sweet juice in the pith cells of the stalks.

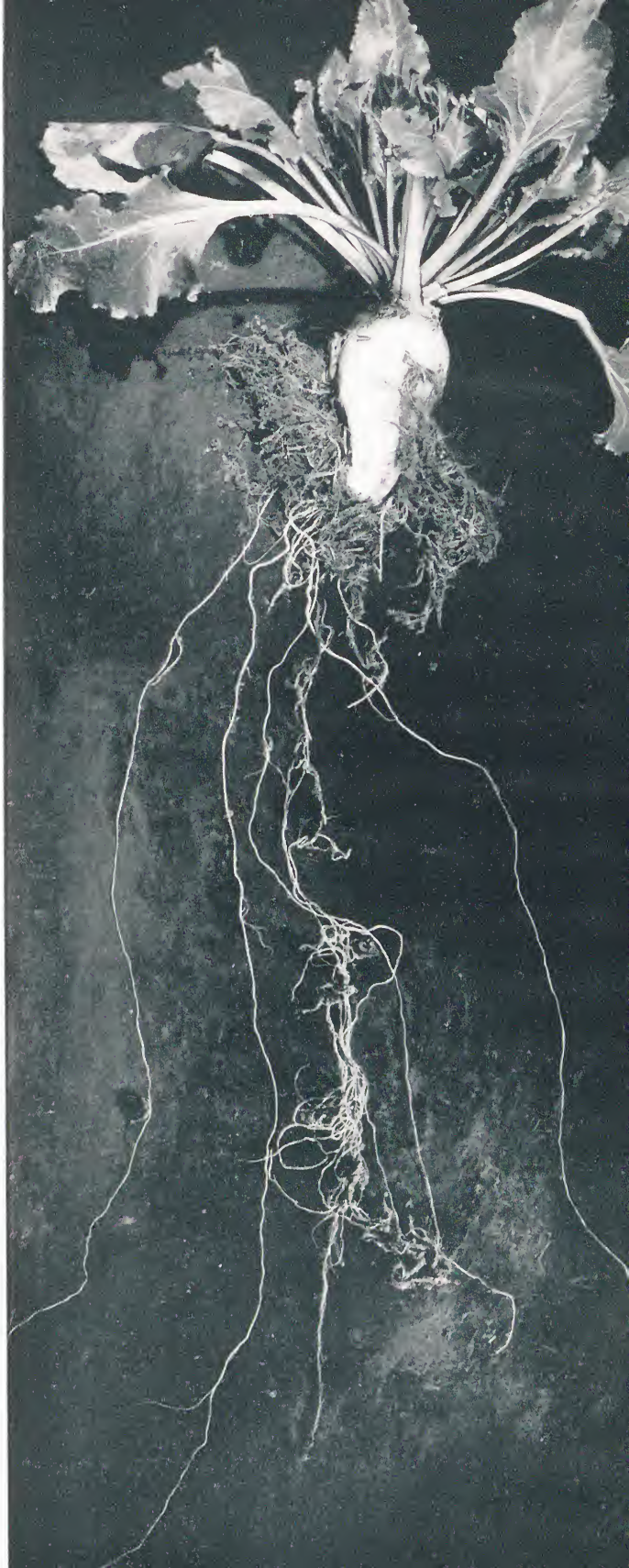
Leaves and stalks are cut off about here when harvesting. They contain no sugar.

As the cane grows the side leaves die and mostly fall away.

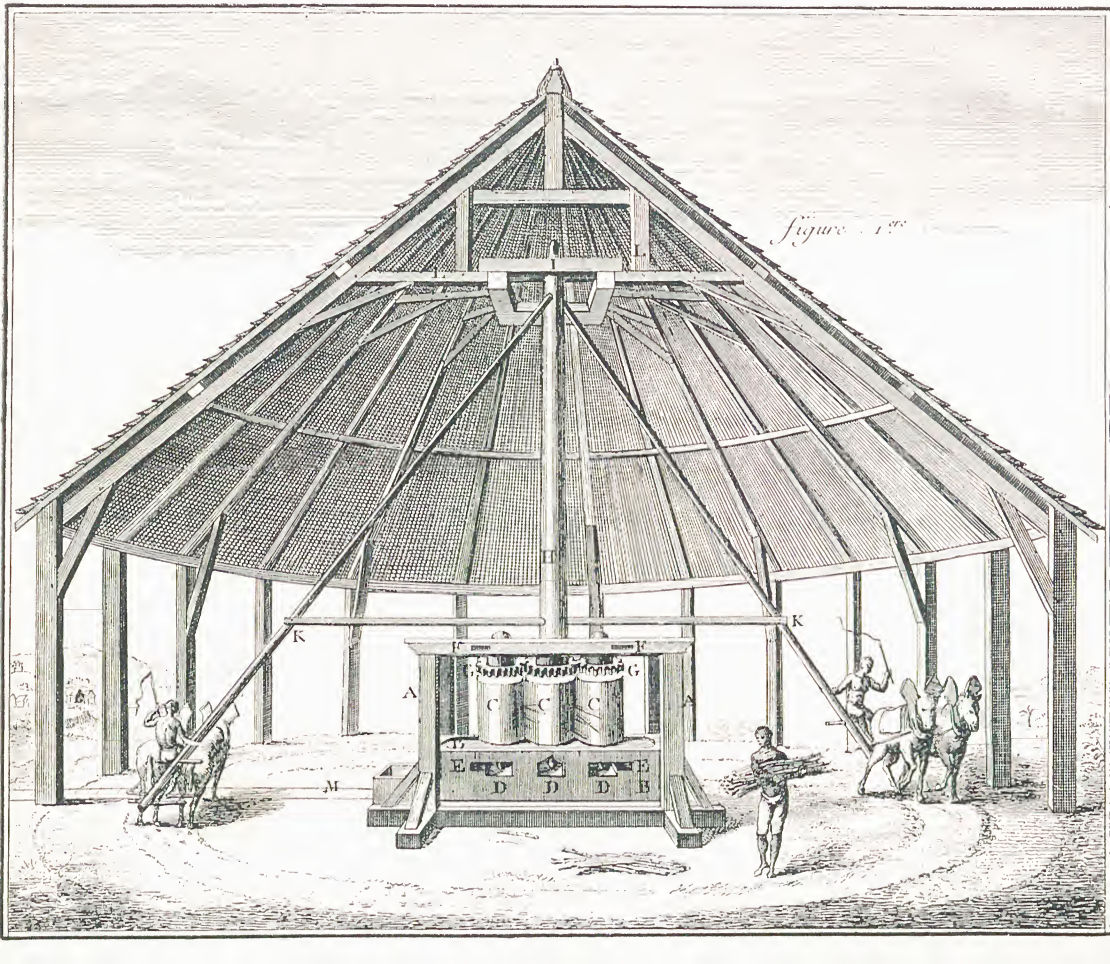
At harvesting the cane stalks are cut off as close as possible to the ground

THE SUGAR BEET PLANT

Cane and beet are the two main sugar producing plants. Beet is a temperate zone plant, and is useful for growing in rotation with other crops. It has the advantage that it can be grown close to the main concentrations of consuming population, but it produces less sugar to the acre than the tropical cane plant. Beet was not used as a source of sugar until the nineteenth century when its cultivation was encouraged by Napoleon. There is no beet sugar industry in the South Pacific. The beet sugar industry in Victoria proved uneconomic and disappeared. *Photograph by courtesy of British Sugar Corporation Ltd.*



Above: A plantation in the Antilles Islands in the Caribbean Sea about 1760. Mill and storehouse on the left, canefields in the middle distance, negro quarters on the right. Most of the world's cane is still grown on the plantation system. *Below:* An eighteenth century plantation mill with metal sheathed vertical wooden rollers. Much of the sugar in the cane was lost in such early mills. From *Agriculture et Œconomie Rustique*, 1762-1772.



It is the stalk which is harvested, by cutting it off at ground level and removing all side leaves and the green leafy top. In Australia and Fiji the majority of stalks, as harvested, are 6 to 10 feet long and normally contain between 14 and 17 per cent of sucrose by weight, averaging about 15.5 per cent over a season. The remaining weight consists of some 12 per cent of fibre, 2 per cent of various "impurities" and 71 per cent of water. The sugar content is considerably higher for two or three months but it is not economic to process the whole crop in such a short period. Australia and Fiji, with very sweet canes and high efficiencies of sugar extraction in the mills, obtain more sugar per ton of cane than, as far as we know, any other cane sugar industry in the world. This is a considerable economic advantage because it is sugar that is wanted rather than cane. In Australia and Fiji, 1 ton of sugar is made from about $7\frac{1}{4}$ tons of cane; in many countries it takes 8 tons or more. If in Australia and Fiji it took $8\frac{1}{4}$ tons of cane, the cane cutters, transport system and mills would all have to handle, every season, another 1,400,000 tons of cane (14 per cent more), and this would obviously cause heavy additional expense.

The stalk has a fibrous, wax-coated, hard rind and inside it are more fibres and pith containing the sugar-bearing cells. These are soft and thin-walled and must be broken by pressure and friction in the mill in order to release the sugar-bearing juice.

When Europeans came to the Pacific they found the natives in many islands cultivating gardens of sugar cane, New Guinea being especially noted for this practice. Many of the New Guinea canes are of the species *saccharum officinarum*, a very sweet, thick-barrelled, comparatively soft-rinded species known as "noble" canes. New Guinea blood, which helps to raise the sugar content, is found in most of the successful new Australian-bred hybrid commercial varieties.

The world owes these sweet, thick, heavy canes to the skill of the Polynesians and Melanesians, or their predecessors, who, since time immemorial, have been growing cane for chewing and have naturally concentrated upon a soft rind and the maximum proportion of sweetness and soft pith. If they were not mankind's first cane breeders, they were at any rate the first selectors of the best natural seedling varieties, and only very recently have we been able to improve on their results for our own commercial purposes.

Growing the Cane Commercially

To succeed commercially, cane requires abundant and regular moisture, a lot of sunlight to obtain a high level of photosynthesis,

and the absence of real cold. An astonishing fact, according to one of the world's leading cane botanists, is that it needs about 1,000 tons of water, absorbed from the soil through the roots and mostly exhaled in due course through the leaves into the atmosphere, to produce 1 ton of sugar in the cane. Nearly all this water, having performed its vehicular and other functions for the plant nutrients, is transpired by the plant. Cane also requires fairly good and well-drained soil. In order to become really rich in sugar, it needs a period of comparative coolness and a reduction in soil moisture; this checks the growth, the sugar content increases and, although we are dealing with a stalk and not with a seed or a fruit, it can be said to "ripen". The north-eastern coast of Australia and the coastal regions of the two islands of Fiji provide such conditions.

The soils and climate of the sugar belts of Australia and Fiji are by no means outstanding for commercial cane culture, considered overall. Nevertheless, yields of sugar per acre, especially in Australia, are considered fairly high for cane grown in one year under natural rainfall. Higher yields are obtained in some parts of the world where cane is irrigated or where it is grown for two years before harvesting, but these methods are not used to a great extent in Australia and not at all in Fiji.

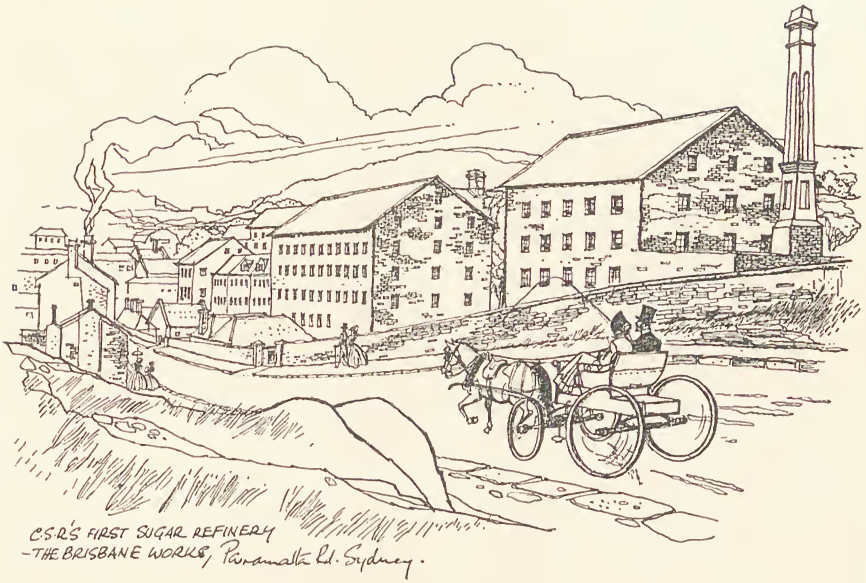
In Australia, average yields per acre over good and bad seasons are about 24 tons of cane, giving 3.3 tons of standard quality raw sugar. In Fiji, the figures are 20 tons of cane and 2.8 tons of sugar. These yields are in terms of manufactured sugar, which means that the losses in processing into raw sugar are fully allowed for. In other words, the efficiency of milling, as well as efficiency in agriculture, plays its part in obtaining these yields.

The struggle for more and more efficiency in all phases of the South Pacific sugar industries is a background theme which runs through many of the succeeding chapters. Good farming methods, good varieties of cane, successful control of diseases and pests, are important factors. The part of efficient transport of cane to the mills and efficient mills and refineries will also be described.

The pattern of farming which has been developed here is distinctive—in its effects on sociology and political development as well as on economics. Until recent times in the most advanced countries, cane required a great deal of hand labour—for planting, chipping weeds and harvesting. In the beginning, in both Queensland and Fiji, labour was imported and the plantation system was followed; the cane was grown on large plantations or estates with large numbers of employees. In both countries this system has been superseded by independent

and generally "small" farmers, selling their crop to a "central" mill. The plantation system still predominates in nearly all other cane-growing countries, with the mill owner often operating the plantation and employing large numbers of field labourers.

The Australian and Fijian "living area" farming system, which is the most distinctive feature of the South Pacific raw sugar industries, creates closer settlement adjacent to mills. The result in Australia is well integrated communities of stable, independent, working farmers of the European race. In Fiji the communities are mainly of Indian tenant farmers with a standard of living and way of life such as few, if any, other rural populations of Asians have achieved. There are profound differences between such communities and those of the traditional plantation system.



CHAPTER 2

The Historical Background

ALAN BIRCH & J. F. BLAXLAND

This is a brief history of the Colonial Sugar Refining Company for the first sixty-odd years of its existence. It deals also with the early history of the sugar industries in Australia, Fiji and New Zealand for, although C.S.R. is only a part of these industries, their growth and the growth of the company are closely related. The last forty years are not dealt with because many developments of this period are covered in other chapters. Much has been omitted which those who know the company would have liked to see recorded. To suit the limited scope of this book, the authors have had to confine their attention mainly to major trends.

Most of this historical sketch is based on research and more extensive writing by Dr Alan Birch of the Department of Economic History in the University of Sydney. Mr B. B. Levick, who recently retired as the company's senior librarian, collected and sorted masses of records and publications for reference and also checked many details. Dr Birch and Mr J. F. Blaxland of the company's staff collaborated in writing the chapter.

September 1955

During the fifteenth century the Venetians, who were leaders in the sugar and spice trade of the Mediterranean, established a pattern of trading and manufacture of sugar which survives to the present day. They bought crude raw sugar, made in the cane fields of Egypt, Sicily, southern Spain and other warmer regions of the Mediterranean, and refined it at Venice, close to their European markets. Throughout the world raw sugar is still the sugar of international commerce. It is an intermediate product, made in the semi-tropical and tropical regions where the cane plant flourishes and transported to the population centres in the temperate zones for refining to a form suitable for consumption.

Australia, even from the early days, had not been solely a penal settlement. It had attracted private business enterprise from Britain. The census of 1836 showed that the colony of New South Wales, which then covered the full length of the eastern coast of Australia from Wilson's Promontory to Cape York, had a population of 77,096 people and over 3,000,000 sheep. Sydney was a flourishing commercial centre, and the foundations of the country's wealth were already laid. During the late 1830s the colony experienced a mild boom. Much English capital was poured into pastoral ventures. To Francis Kemble, London company promoter, and William Knox Child, Deputy Lieutenant of the County of Kent, it looked a likely place for a sugar refinery, and in 1839 the Australian Sugar Company was formed in London. Lured by Kemble's grandiose predictions of a profit of £40,000 a year, Child sold his estate and put his capital into the venture. Steam engines, boilers, plant and machinery to the value of £20,000 were purchased with Child's money and shipped to Sydney to equip a sugar refinery, according to the company's prospectus, "on the banks of the Cook's River . . . in the village of Canterbury, within five miles and a half from Sydney". But before the refinery commenced operations there was a crippling trade slump, and disagreements among the principals led to the dissolution of the company.

A new company, the Australasian Sugar Company, was formed to take over the assets of the Australian Sugar Company. In the terms of its deed of settlement of 31 March 1842, it was "to carry on the Trade or Business of purchasing and refining raw sugar, the sale of Sugar whether raw or refined by the company, the sale of Molasses, or the distillation of such molasses into spirits, the manufacture of Animal Charcoal, Ivory Black, Soda, Sal ammoniac, Black Ink and such other business connected with the general objects of the company as the Directors shall think fit".

The capital of the new company was £23,000 sterling in £50 shares.

Kemble and Child reconciled their differences and persuaded several Sydney gentlemen and merchants to head an imposing list of more than sixty shareholders.

In September 1842 the manufacture of sugar was at last begun, with raw sugar imported from the Philippines. Towards the end of the year the Australasian Sugar Company advertised in the Sydney newspapers that it was "now in operation and will be enabled to supply the whole of the Australian Colonies with refined sugar at the following prices:

Fine loaves or Titlers ...	5d.	per pound
Lump	4½d.	„ „
Crushed Lump ...	£43	„ ton
Fine Pieces	£26	„ „
Molasses	£13	„ „ ."

In 1843 Edward Knox (no relation to William Knox Child), a young man twenty-four years of age, born and educated in Denmark and only three years resident in the colony, took over the management of the struggling sugar company. He remained as manager until 1846 and as a director until 1854, when disagreements again arose between the partners and the Australasian Sugar Company was in its turn dissolved.

A new company, the Colonial Sugar Refining Company, was then formed on 1 January 1855. It was a partnership of unlimited liability with a capital of £150,000.

At first there were only ten shareholders, five of whom were directors of the company. The first directors were William Fanning, Walter Lamb, William Walker, Edwin Tooth and Edward Knox. Shareholders included J. H. Challis, Daniel Cooper, Archibald Walker and James Robey, who had made himself valuable to the previous company through his technical knowledge and skill. The company was supported by the most important banking and mercantile interests in Sydney at that time. Edward Knox was also chairman of the Commercial Banking Company, established in 1834. Walter Lamb was the son of an English naval captain who had settled in Sydney after the Napoleonic wars to establish a merchant house. William Walker, also a merchant, was associated with the Bank of New South Wales and Edwin Tooth was a brewer.

During the half-century before the establishment of refineries in Sydney low quality "ration sugars", imported from Java, Mauritius and the Philippines, provided the colony's staple sweeteners. Commercial production of raw sugar for the local refineries did not

commence in Australia until the late 1860s. But as early as 1817 canes, said to have been introduced from Tahiti by Thomas Alison Scott, had been planted in the Sydney Botanic Gardens. Scott was appointed by the Government in 1823 to take over the growing of sugar cane at the penal settlement of Port Macquarie, and in 1827 succeeded in making some crude sugar. He was dismissed by Governor Darling in 1828, but continued to advocate the development of cane-growing in New South Wales. Scott claimed to have supplied many planters with advice and with cane for planting when the industry made a scond start on the northern rivers of New South Wales and in Queensland. Captain Louis Hope, the first commercially successful plantation owner in Australia, obtained some of his cane cuttings from Scott, who was later granted a small pension in official recognition of his pioneering work. He was given a grant of land at Point Clare, near Gosford in New South Wales, and died there in 1881. The village of Tascott, near Gosford, perpetuates his name.

Scott and others had shown the way but it was the dislocation of the cotton industry in the southern states of America, caused by the Civil War, which provided the first incentive for the cultivation of crops in the tropical areas of the north-eastern Australian coast and in the Fiji Islands. Cotton proved unsuccessful in both Queensland and Fiji and many of the pioneering planters turned to the cultivation of sugar cane. They were encouraged in Queensland by the Sugar and Coffee Regulations of 1864, by which the Government made available selected lands at a nominal rental, with right to purchase, to any persons or companies undertaking the growth of either sugar cane or coffee on an extensive scale.

Throughout the world at that time, and still largely today, cane was grown by coloured labourers working on plantations, and this was the system naturally adopted by the pioneers. In Australia and Fiji most of them started by using South Sea Islanders to clear their land and to cultivate and harvest their crops. These labourers were not slaves, such as those then employed in the cane fields of Puerto Rico and Cuba. They worked for their keep and a small wage, the terms of their employment, working conditions and repatriation being regulated by Acts of the Queensland and Imperial Governments.

The recruitment of South Sea Islanders by "black-birders" has been described by Noel Deerr in his *History of Sugar* as "conducted with a callousness and brutality equalling anything that happened in the course of the African slave trade". Despite nominal government supervision, there were also undoubted abuses on the plantations but most of the Australian planters seem to have treated their labourers

humanely, considering the harsher standards of those times. Deerr, an authority on the history of labour conditions in sugar production, states "once landed in Queensland it does not appear that the labourers were ill-treated". H. T. Easterby, in his historical review of the Queensland sugar industry, states "on the whole they were well treated".

In Australia the pastoral industry was the first to use indentured labour. In 1839 there were over a thousand indentured Indians in the country, all of whom were engaged by pastoralists. The first Kanakas, introduced into Australia during the 1840s, were used as shepherds. In the early 1860s larger numbers of Kanakas were used, originally by Robert Towns to work on cotton plantations and later, when cotton failed, to work in the cane fields. Chinese coolies were used in the mining industry from the early 1850s and were imported by the South Australian Government to build the railway from Darwin to Pine Creek even as late as 1883-89.

In 1842, when the first refinery commenced operations in Sydney, the colony of New South Wales was still being administered by a governor. Citizens of Sydney were petitioning the home authorities for some measure of self-government for the colony and settlers at Port Phillip were agitating for separation from New South Wales. The country around Moreton Bay convict settlement, then part of the northern district of New South Wales, had only the year before been thrown open for settlement at twelve shillings per acre. In 1863, when Captain Louis Hope first commenced growing cane on a commercial scale on his plantation at Ormiston near Brisbane, slavery was still in force in the Dutch colonies, in Puerto Rico and in Cuba, while in America its future was still being decided by the Civil War. In New Zealand the Maori wars were to continue for another eight years. Despite the large increase in total Australian population following the gold rushes, the census of 1861 had shown that the population of Queensland, separated from New South Wales in 1859, was only 34,000.

The early planters who followed Hope in northern New South Wales and in Queensland lacked experience, capital and knowledge of tropical agriculture and of the technology of sugar milling. Their field practices and mills in those days were similar to those of a much earlier period in the West Indies.

It was not until the early eighties, at the time of the Sudan War, and twenty years after Hope and the early planters pioneered the coast of Queensland, that the Colonial Sugar Refining Company entered the field of raw sugar production in both Queensland and Fiji. The company and its predecessors had been in the sugar refining business for some forty years and in raw sugar milling in northern

New South Wales for twelve years when it embarked upon this major and decisive expansion of its activities.

The Period of Edward Knox

Born in Denmark in 1819, Edward Knox was to grow up a determined and ambitious man, gifted with extraordinary commercial ability. His father was George Knox, son of a Scottish glazier who had married the sister of Arthur Howden, a hackle-master whom the Danish Government had persuaded to leave his employment in the linen industry in Edinburgh to ply his trade in Denmark. George Knox became a merchant, settled in the seaport city of Elsinore, but he died when Edward Knox was eleven years old, leaving his English wife in comparatively poor circumstances. Edward determined to become a merchant like his father, and it was necessary for his mother to borrow money from her brother, James Mullens of London, to send the boy to Lübeck in Germany for a thorough grounding in the ways of the commercial world.

At the age of sixteen, equipped with a knowledge of English, Danish, French and German, Edward Knox was given a job as a junior clerk in his uncle's merchant house in London. The firm of Perkins, Schlüsser and Mullens had an extensive business in the Baltic trade. It was a good training ground for a young man who was to make his mark as a merchant; but apparently Edward was a fiery and spirited youth and after several years he and his uncle quarrelled violently over his mother's business affairs. He was dismissed. "Whatever his talents may be," his uncle wrote, "and I am ready to admit his are of a high order, they will no doubt enable him in time to make his fortune if he can only make up his mind to be satisfied with being a junior clerk for the present and not expect to jump from junior clerk to partner."

But Edward Knox could not wait for this seemingly remote prospect. He had been thinking for some time of emigrating to Australia in order to make a fortune like Captain John Macarthur. Somehow he raised a modest amount of capital to take up some land there and to buy a few hundred sheep, and took passage, travelling steerage, in the barque *Sophia*, arriving at Port Jackson on 26 February 1840. His mother had written to him, when she learned of his bold plan, "Everybody is willing to make allowance for the sanguine hopes of an active, enterprising youth, eager to make his way quickly in the world for his mother's and sister's sake but certainly too sensible to persevere and lose his best years in tending sheep and remain an exile." She even

likened him to Robinson Crusoe! Knox soon decided for himself that he was not cut out for the pastoral life. After a brief period at Bayly Park, a pastoral property at St Mary's near Sydney, he obtained a position as accountant of a real estate firm, the Australian Auction Company.

His advancement from then on was rapid. In May 1843 he became manager of the auction company. In August 1843 he was appointed manager of the Australasian Sugar Company at a salary of £250 a year and "more when times mended". In the following year he was appointed by the Chief Justice an official assignee to administer under the Insolvents Act the property of Sydney merchants who had suffered in the slump of the 1840s. In 1845 he was appointed a director of the Commercial Banking Company of Sydney, which had been formed eleven years earlier. In 1847, at the age of twenty-eight, he became managing director of the banking company and was largely responsible for the reorganization of the bank when it was re-incorporated with a capital of £120,000.

During his twenties and early thirties Knox applied himself with exceptional vigour to the task of establishing his reputation and his fortune. He held a number of executive posts at the same time and continued to buy and sell real estate. He was thirty-five when the Colonial Sugar Refining Company was formed in 1855 and had already established himself as a leading personality in the business life of Sydney. From his fifteen years in the colony he had amassed a considerable personal fortune, most of which was invested in the new sugar company. A daguerreotype portrait from this period shows him as handsome and determined but, despite a suggestion of abundant self-confidence in the portrait, he was, according to the testimony of his fellow merchants, "a perfect man of business and a highly agreeable person".

On his own admission Knox was "only a theorist in sugar boiling" but he was to bring his acute commercial sense and his flair for organization to the new Colonial Sugar Refining Company. It was a case of the time and the man being right. During the 1850s the colony's population increased rapidly in size and in wealth and the local market for refined sugar expanded proportionately. But raw sugar markets fluctuated violently, making sugar refining a hazardous business. With sources of supply far away and transport unreliable it was necessary to hold considerable reserves; but a large stock of raw sugar at the refinery followed by a tumbling of prices would bring calamity. Competition from merchants who imported sugar was intense. The risks were great but the rewards for success could also be great.

The first *Statement of Affairs* of the company dated 30 June 1855 was typical of companies relying heavily on trade credit and correspondingly vulnerable:

LIABILITIES	£	s.	d.	ASSETS	£	s.	d.
Capital	150,000	0	0	*Plant, Machinery & Land*	121,464	8	11
Bills Payable & Import A/c	119,610	13	8	*Stock on Hand*	87,892	17	6
Sundry Creditors	8,914	2	2	*Cash, Bills Receivable & Sundry Debtors*	19,999	15	8
Profit & Loss	16,123	1	10	*Raw Sugar Imports*	53,570	9	6
				Sundry Stocks	5,405	7	7
				Consignments	6,314	18	6
	£294,647	17	8		£294,647	17	8

Business for the first year was brisk, and in the following year of 1856 a dividend of 50 per cent was declared.

Prospects were so encouraging that in June 1857 the shareholders, "being of the opinion that the growing demand for refined sugar in the Australian Colonies . . . calls for the establishment of a sugar refinery and distillery on a large scale" in Melbourne, decided on the formation of an associated company, the Victoria Sugar Company. Half of the £150,000 capital was subscribed by C.S.R. shareholders and the other half by Melbourne merchants. Edward Knox was appointed superintendent and chairman of the Victorian company and personally arranged for a refinery to be built at Sandridge, now Port Melbourne.

Having established what appeared to be two flourishing sugar companies, Knox decided that he had made the fortune which as a young man he had set out to seek. He sold his home and some of his shares in the Colonial Sugar Refining Company and, late in 1857, embarked for Europe, leaving his property in the care of Grafton Ross, the company's new manager. He had hardly set sail when the crash came. There was a world-wide fall in the price of raw sugar, coinciding with a depression in Australia. The company was caught with a large stock of expensive raw sugars on its hands, and imports of sugar at ever-lower prices flooded the market. Knox was bombarded with letters telling him he was ruined.

Before he could return to Sydney, another blow was struck at the company, which appeared certain to founder. The manager of the

sugar house, one of the shareholders, James Robey, planned a rival establishment on the north shore of Sydney Harbour. When this was discovered he was dismissed and he then threatened to dissolve the company. The Sydney directors were ready to throw in their hand. Estimated losses were £120,000; Robey, their most experienced production colleague, had gone and they were faced with legal action. Dissolution would have ruined Knox. He persuaded some English shareholders to make a loan to the company and hurried back to Sydney, where he succeeded in preventing the Robey equity suit.

From the day of his return Knox threw his great energies and abilities into the task of restoring the fortunes of the sugar company. He was faced with ruin and he had been bitterly criticized for paying such a large dividend in 1856. His fortune and his reputation were in jeopardy. Before he left for England Knox had sold nearly £20,000 of C.S.R. stock, on which he had guaranteed to double any deficiencies in the company's dividend below 20 per cent for the next five years. The purchaser wanted to release him from this bond, but it is indicative of his character that he insisted on keeping to his undertaking, even though he had great difficulty in honouring it. It is also an indication of his principles that he had appointed as main banker for C.S.R. the Bank of New South Wales, rather than the Commercial Banking Company of which he was Chairman.

It was ironical that this man, who had determined to build his own fortunes on firm and lasting foundations, should have been forced to choose for his field an industry which was overwhelmingly influenced by outside circumstances. Raw sugar prices were beyond his control. Even so, it was still possible to achieve some degree of understanding of the market, even with all its vagaries. Knox came to develop an almost instinctive anticipation of the sudden booms and depressions in the raw sugar markets of the world.

During the second half of last century, as populations grew and standards of living rose, sugar passed rapidly from a luxury food to a normal item of diet in the more advanced countries of the world. Over the same period the beet sugar industry, founded in France during the Napoleonic wars, was developed on the continent of Europe by subsidy and millions of tons of bounty-fed beet sugar were dumped on the markets of the world. Sales below cost of production of huge quantities of such sugar created great instability in raw cane sugar prices.

Throughout the sixties Knox struggled to keep the company's head above water, to pay off its debts and to put aside reserves to redeem debentures issued after the crisis in 1857-1858. Cut-throat competition from imports was an additional menace to stability. In Knox's own

words, the company's profits could "be reduced by £70,000 per annum at one blow from the importing merchants".

A partial answer to the problem of the fluctuations of the international market in raw sugar was to grow one's own supplies. From the establishment of the first plantations in 1863, there had been a mild boom in cane-growing and raw sugar manufacture in northern New South Wales and in Queensland. In 1868 Knox decided to enter this field and in 1870 he put his second son, Edward William Knox, in charge of the project. Several mills were established on the northern rivers of New South Wales and during the 1870s young E. W. Knox, who had started in the company's business as a clerk at the age of seventeen, learnt in the hard school of experience the principles of raw sugar manufacture and the wider principles underlying the management of men and large industrial organizations.

Edward Knox's venture into milling was to have great influence on the development of the raw sugar industry in Australia and on the development of C.S.R. itself. It will be dealt with more fully in the section on the period of E. W. Knox which follows. Full credit is due to Edward Knox, however, for initiating the move, as his directors acknowledged in 1877 on his temporary retirement as chairman: "To his guidance must be attributed much of the success that has attended the operations of the Company, particularly in orginating and bringing into successful existence the mills on the Clarence River".

The company prospered and expanded during the seventies. By 1875 the reserves, meticulously conserved by Knox and his associate Grafton Ross, exceeded £200,000. The new mills in northern New South Wales were successful and accounted for more than half of the company's earnings. Several small ships were bought to bring molasses and raw sugar from these new mills to the company's distillery and refinery in Sydney. A new refinery was commenced in 1875 at Pyrmont on the shores of Johnston's Bay in Sydney Harbour. It began operations in 1878 and was capable of producing weekly over 400 tons of refined sugar, about one-twelfth of its present capacity.

In 1880 Edward Knox, then sixty years of age, handed over the day-to-day management of the company to E. W. Knox. Shortly after his appointment as manager of the Australasian Sugar Company some thirty-seven years earlier, he had married Martha Rutledge, the daughter of a pastoralist. She bore him four sons and he was well pleased with them. "My boys", he wrote to a friend in 1875, "are all, I am happy to say, steady young fellows and will, I hope, someway or other leave their mark behind them." George, the eldest, became a member of the legal profession in England; the second son, Edward

William Knox, carried forward the enterprise that his father had commenced; T. F. Knox played an influential role as managing director of Dalgety and Company Limited and Adrian, the youngest, became Chief Justice of Australia and, like his father, received a knighthood for his public services.

Although in 1856 he was a member of the Legislative Council in New South Wales, Edward Knox kept aloof from the rough and tumble of politics. He was deeply interested in public affairs, however, and had been a founder member in 1851 of the Sydney Chamber of Commerce and of the Royal Exchange, and a director of the Sydney Railway Company. In 1856 he was appointed a member of a committee of advice to the Australian Agricultural Company. After his retirement from executive management of the Colonial Sugar Refining Company he continued on the boards of both C.S.R. and the Commercial Banking Company of Sydney. He had helped to build these two great Australian organizations and most of his considerable personal fortune was invested in them. His later years were occupied also in helping the Prince Alfred Hospital and the Carrington Convalescent Hospital; he had always been concerned, as one of his fellow merchants said of him, in doing "good by stealth in religious and charitable matters". He lived an honoured and useful life for twenty years after his retirement from the active control of C.S.R. and was knighted in 1897, some years before his death in 1901 at the age of 81.

The slump of 1857-1858 was a turning point in the life of Edward Knox and also marked, far more than the formal incorporation in 1855, the beginning of the Colonial Sugar Refining Company as an enterprise with a positive character and policy. The Knox who returned to Sydney to rehabilitate C.S.R. and his own finances and reputation was no longer the personally ambitious, fortune-seeking young man of his earlier days. From then on he was to devote his life to building a great industrial and commercial organization, a purpose which he achieved by unceasing work and a constantly pursued policy of conserving in the business as much of its earnings as he could persuade the shareholders to forgo.

After the harsh lesson of 1857-1858, profit for the shareholders and himself was almost a subordinate objective. He determined to build on rock foundations, not by eliminating risks—that was impossible—but by meeting and overcoming them and by making his base of operations financially impregnable.

As the years progressed, pressure for more dividends from the increasing body of shareholders was only one of the many obstacles to be overcome in his task. The dividend policy he pursued was un-

usually careful and conservative. Sugar was an uncertain business. Never again was there to be a repetition of the 50 per cent dividend of the over-confident days of 1856. From some guarded statements by Edward Knox himself and from more explicit statements by his son, E. W. Knox, who succeeded him, we know that the amount of the dividend never exceeded 5 per cent of the cost of assets, and the assets continually increased through prudent internal re-investment.

The policy of saving and re-investment was to be followed by Edward Knox's son. Its fruits were not wholly reaped by shareholders during the lifetime of Edward Knox and it remained for future generations to enjoy the full benefits of his policy of frugality and ploughing back of earnings. The early shareholders' enforced renunciation of rewards was eventually to provide the essential foundation of capital for great development in the raw sugar industries of Australia and Fiji, and for the establishment of sugar refining industries elsewhere on the Australian continent and in New Zealand. In our own times similar policies were indirectly to make possible the launching of new chemical and building materials industries in Australia.

The Clarence River Venture

Crude forms of sugar have been made for over two thousand years in India and southern China, and the old methods of manufacture are still continued in many Asian village communities. Separate stalks of sugar cane are fed singly between wooden rollers which are turned by hand or by a beast following a monotonous circular path around the primitive crushing machine. The juice expressed by the rollers is collected and boiled in open pots over wood fires until concentrated, when it is poured into cooling vessels where sugar crystals form in the syrup. The mixture of crystals and syrup is then poured into moulds and sets solid as it cools.

The pioneers who first attempted to make raw sugar in Australia used equipment hardly more advanced than these village manufactories. In 1867 there were six mills in Queensland and between them they produced only 168 tons of raw sugar. In 1868 nine mills were operating in northern New South Wales, with a total combined output of 60 tons.

Edward Knox watched these developments with interest. Assured and adequate supplies of raw sugar at an economic and stable price is an ideal towards which every sugar refiner strives. Raw sugar production was a field in which he had no experience, so Melmoth Hall, a West Indian planter of sixteen years' experience, was engaged

SCULPTURE GALLERY,

DOWLING STREET, WOOLLOOMOOLOO.

MR. W. G. NICHOLL, begs to announce to the admirers of art and the Public in general, that his gallery is now open for exhibition, between 10 A.M., and dusk.

Admission on Thursdays 2s. 6d.
Other days, 1s.
Catalogues 6d.

When the admission is 2s. 6d. the Catalogues will be given away.

Tickets may be had at Messrs. Woolcott and Clarke's, Printsellers, George-street, and at the door. 3652

JAMES. W. WAUGH

BEGS to intimate that, having taken those premises,

No. 14, Hunter-street,

he has this day commenced business as a

BOOKSELLER and STATIONER,

When he hopes that, from his experience of the trade, both in Edinburgh and the Colony, he may command a share of public favour.

Orders from the interior (accompanied by a remittance or reference in town) punctually attended to.

Country Storekeepers supplied on liberal terms.

17th November, 1851. 3633

COMPANY'S SUGAR.

ON SALE, by the Australasian Sugar Company, at their stores,

No. 427, George-street,

No. 1 pieces, of superior quality, at £25 per ton, specially packed for the use of parties proceeding to the Diggings, in strong canvass bags containing 70 lbs. sugar each.

A. ASHDOWN,
Manager.

Sydney, 18th November, 1851. 3681

GOLD DUST.

THE undersigned is a cash purchaser at the highest market rates.

R. CAMPBELL,
Circular Quay.

Sydney, 21st August, 1851. 2098

GOLD.

THE undersigned are Purchasers of Gold Dust at the highest price.

R. CAMPBELL, SEN., & CO.
Bligh Street. 3587

WRITING DESKS.—Russia leather Ne Plus Ultra, rosewood and mahogany, plain and brass strapped ditto.

HENRY PARKES, Hunter-street

COWVAN'S STROPS.—A small parcel of these celebrated and unequalled Razor Strops, just opened.

HENRY PARKES, Hunter-street.

rops, pepper, rice, starch, blue, soda, Liverpool salt, saltpetre, rock salt, &c,

"Tobacco," negrohead and colonial; soap and candles, Belmont sperm, &c.; carbonate soda; woolpacks, 10 lbs. three-bushel bags, &c., &c.

SAMUEL D. GORDON.
3, Bridge-street, Sydney. 2906

FOR SALE!!! At the Albion Wharf, (foot of Market-street,)

Hardwood, at 8s. per 100 feet, delivered in any part of the city
Moreton and Wide Bay pine, in logs and boards
Cedar, in log and boards
Shingles, laths, and fencing stuff
Packing and wine cases
Soap and candle boxes
The splendid cargo of Kauri pine, ex Laying
COALS—Newcastle, by the ton or cargo
Maitland, 18s. per ton, delivered.

November 13. 3611

TO WINE GROWERS.

THE Undersigned are prepared to enter into arrangements with parties desirous of obtaing Vinedressers, Wine Coopers, &c., from Germany, and would undertake to procure, engage, and have conveyed hither, skilled labourers of the above description, free of all expense to the employers.

Immediate application is requested to

1221 KIRCHNER AND CO.

PRICE OF FLOUR, AT GARSED AND MORKILL'S STORES :—

BATHURST.

Fine Flour..... 33s.
Seconds ..... 31s. } per cwt.

TURON,

Opposite the Post Office,

Fine Flour..... 44s.
Seconds ..... 40s. } per cwt.

TURON,

Between the Flat and Lower Crossing Place.

Fine Flour..... 48s.
Seconds ..... 44s. } per cwt.

NEWTOWN, OPHIR.

Fine Flour..... 45s.
Seconds ..... 41s. } per cwt.

From sound Australian and Van Diemen's Land Wheat, ground in Sydney.

The highest market price given for Gold on the Turon in any quantity; and at H. DIXSON'S, Tobacco Warehouse, No. 494, George-street, Sydney. 32

BOHEMIAN GLASS.—Vases of rich and various patterns, toilet bottles, jewel stands, decanters, lustres, baskets, pomatum pots, &c.

HENRY PARKES, Hunter-street.

PARASOL FURNITURE.—Ivory and Bone Hooks, plain and fancy sticks, handles rings, &c.

HENRY PARKES,
Hunter-street.

Extract from front page of old Sydney newspaper.
An advertisement by the Australasian Sugar Company appears about mid-way in the left hand column.

NOTICE TO SUGAR PLANTERS.

IN RESPONSE TO NUMEROUS APPLICATIONS MADE TO THIS COMPANY TO ERECT SUGAR MILLS on the Northern Rivers of this colony, the DIRECTORS OF THE COLONIAL SUGAR REFINING COMPANY, DESIRE TO NOTIFY, that on being assured that a sufficient area of land has been planted, to warrant the required outlay, they will be prepared to

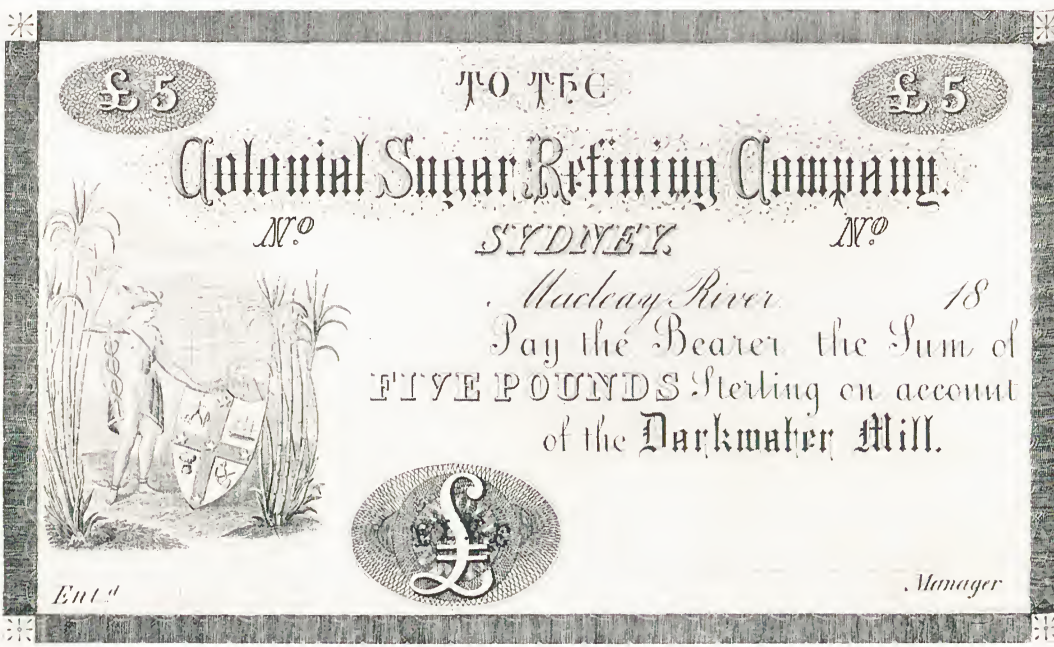
ESTABLISH CENTRAL SUGAR MILLS,

in the principal sugar growing districts.

Communications addressed to the undersigned, on the subject of the AREA ALREADY UNDER CANE that can be relied upon, and the price at which growers will be willing to deliver the same at mills centrally situated, are invited by the Board.

J. GRAFTON ROSS,
Manager Colonial Sugar Refining Company,
24, Bridge-street, Sydney 2nd July, 1868.

The advertisement above appeared in the *Clarence and Richmond Examiner* of 14 July 1868. Central sugar mills are large mills supplied with cane by nearby farmers in a district, as distinct from mills which grow cane on their own plantations. *Public Library of N.S.W.*



The Northern Rivers districts of New South Wales were isolated, undeveloped areas when C.S.R. erected its first mills in 1869. It was necessary for the company to issue its own currency. *Reduced-scale reproduction from plate in possession of C.S.R.*

in 1868 and sent to inspect the new cane-growing districts in northern New South Wales. His mission was to seek areas suitable for the establishment of mills and to assess the supply of cane which might be forthcoming from growers. His reports led the company to take a decisive step. It decided to adopt the central mill system, by which independent growers supply their cane to a large, centrally-situated mill. An advertisement in the *Clarence and Richmond Examiner* announced:

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J. GRAFTON ROSS

Manager Colonial Sugar Refining Company,
24, Bridge-street, Sydney, 2nd July, 1868.

In August 1869 Edward Knox advised his shareholders that mills were being erected on the Macleay and Clarence Rivers. These mills—Darkwater on the Macleay, Southgate and Chatsworth on the Clarence—commenced crushing cane purchased from local farmers in 1870. The Macleay district soon proved too frosty for cane-growing and its mill was transferred to the Clarence in 1873. Edward Knox himself spent the first season at Darkwater and gained first-hand experience of the difficulties attending the establishment of a new industry.

Edward Knox's adoption of the independent farming and central mill system was a daring step. Whether he had any precedents in mind is not known. The system soon proved a most successful one which materially affected the company's subsequent fortunes. The new C.S.R. mills, with their up-to-date machinery and techniques of manufacture, were large-scale factories quite unlike the small plantation

mills of the times. In course of time Australia and Fiji turned completely away from the plantation-cum-mill system of raw sugar production then developing, and followed the system of small farms with a central mill introduced to the South Pacific by Edward Knox on the Clarence River.

Looking back on his career, Edward Knox wrote to a friend, "I can only expect to leave a kind of smeary, sugary track behind me. Even this will satisfy if those who have been associated with me in launching first the refining and, subsequently, the sugar-growing industry [of N.S.W.] have reason to think that my life has not altogether been wasted." Actually Knox launched neither industry. The credit for launching the sugar refining industry must be given to Francis Kemble and William Knox Child, who promoted the Australian Sugar Company in London in 1839. But if Knox did not actually launch the refining industry he certainly must be given full credit for establishing it firmly. Similarly, the credit for launching the raw sugar industry must go to pioneers like Scott. But, again, it is to Edward Knox, more than any other, that credit must be given for laying the foundations and fixing the pattern on which the raw sugar industries of the South Pacific were subsequently developed.

In 1870 young E. W. Knox, aged only twenty-three, was sent to the Clarence as superintendent of mills. As he admitted many years later, "All that could be said in my favour on taking up this work was that no one in the service knew more, or much less, than I did about making sugar, and my feelings for the first year were those of a motherless foal turned out to pick up a living in the cold, hard world."

There were many difficulties to overcome. The Clarence was an isolated, undeveloped district. It was necessary to build houses and to establish a retail store to provide for the workmen's needs. The company had even to issue its own currency notes. The machinery was in "an unfinished state". There were accidents. Like Knox, the men were new to their work. The first season was very wet and the cane supply to the mills was unsatisfactory. The first shipment of sugar, made in a solid form technically referred to as "concrete", was found on arrival in Sydney to have lost its solid form and to have "deliquesced and drained excessively". Knox was very pessimistic and reported to his father, "The venture is an exceedingly risky one and the question whether we will make large profits or none at all depends in a great measure on circumstances over which we have no control." In the event of a flood the "prospects of even paying interest and working expenses . . . would be very doubtful".

From his reports, however, it is apparent that young Knox was

soon able to master the problems arising from the establishment of the infant industry. He had a lively intelligence, ability and outstanding determination. He introduced many important improvements in the management of the mills and in the agriculture of the farmers who supplied them. He concentrated on persuading the farmers to cultivate sweet canes, on reducing running expenses and on raising the efficiency of the processes by which raw sugar was extracted from the juice of the crushed cane.

In the second season the mills were the chief source of the company's profits. It was a real achievement and E. W. Knox was no longer pessimistic. "I must now confess", he reported, "that there seems to be every probability of the manufacture of sugar becoming permanently established in New South Wales, and of our ultimately reaping some reward for the capital which we have spent in developing this industry."

During his ten-year term on the Clarence River Knox gained first-hand experience of milling and cane-growing which was to prove of great service when, during the 1880s, C.S.R. expanded to Queensland and to Fiji. He also saw other experienced raw sugar millers in the Caribbean, where he was sent in 1876 "with a view to enabling him to compare the results on the Clarence River with those of the West Indian Islands". On his return in 1877, Knox made a detailed survey of the Tweed and Richmond Rivers, where farmers, impressed by the prosperity of those growing for the company on the Clarence, were petitioning the company to build further central mills.

E. W. Knox had taken up his position as general manager when crushing commenced in 1880 at Condong Mill on the Tweed. The next year Broadwater Mill started on the Richmond. Broadwater was described by Despeissis in 1891, in an article in the *Agricultural Gazette of New South Wales*, as "by far the most important sugar factory, not only in this Colony but in the whole of Australasia". It was able to crush 900 tons of sugar cane in a day, compared with 2 or 3 tons a day at many of the smaller mills. This one mill made as much raw sugar in a month as all the mills in New South Wales and Queensland made in 1868. In the slumps of the 1880s and 1890s the small, inefficient mills were not able to weather the economic storm. From a total of 102 mills in New South Wales in 1885 the number fell to 33 in 1890. By 1912 only the three C.S.R. mills, Harwood, Broadwater and Condong, survived. (Of the Clarence River mills, Southgate had been transferred to Queensland and Chatsworth merged in 1888 with Harwood, which started crushing in 1874 and is the oldest mill in Australia.) Edward Knox's choice of the system of small farms and large central factories had proved a wise one.

Expansion Under E. W. Knox

The Colonial Sugar Refining Company had been established for twenty-five years when E. W. Knox took over from Grafton Ross as general manager in 1880. Knox was then thirty-three and had been in the company's service since he was seventeen. He had received an early commercial training in the Sydney office and a thorough training in management and the practice of raw sugar manufacture on the Clarence River. He had also learnt the importance of good agriculture and had gained considerable skill in encouraging farmers to follow the best methods.

Although Edward Knox, as chairman, was still holding the purse strings, young Knox was able to draw upon the accumulated reserve funds which his father had built up over the previous quarter-century. He also inherited, fortunately for the company, his father's commercial ability and determination. He was very conscious of his father's example, in both character and achievement. He remembered vividly the enforced economy in the Knox household on the family's return from England in 1858 but the memory of past difficulties did not deter him from launching out into a number of bold and ambitious new ventures. During the first five years of his general managership C.S.R. established seven large new sugar mills in New South Wales, Queensland and Fiji, and built a sugar refinery in New Zealand: achievements which even on the scale of today's industrial development would be considered impressive.

E. W. Knox was born and educated in Australia. His grandparents were Scottish and English, his father was born in Denmark and his mother in Northern Ireland. The result of this "composite nationality" he described on one occasion in these words: "When I might have been expected to show that I inherited from my Ulster ancestors 'the ornament of a meek and quiet spirit' I probably played the part of a pragmatical Scot. When the occasion seemed to call for Scotch economy I might be a free spending Englishman (I admit that this was not often the case) and, similarly, an argumentative Australian in circumstances when someone else would show a disposition to take a course involving the least discussion or trouble."

Certainly Knox, as a young and somewhat impetuous and autocratic general manager, showed no obvious signs of meekness. He surrounded himself with able lieutenants, who supported him with the greatest loyalty in his venturous plans, but he was not disposed to let his officers assume they were his equals when it came to a decision. He was, in the words of a later general manager, "the leader and pusher-on".

The magnitude of the administrative effort required and the tempo of expansion are hard to visualize. "Everything went like an express train," E. W. Knox remarked, "even the increase of the indebtedness of the company for the new ventures." In five brief years the mills on the Clarence River were merged in one big mill at Harwood, and Broadwater on the Richmond and Condong on the Tweed started operating. New areas were opened up in Queensland and three big new mills with their transport systems and cane plantations were established: in 1883 Homebush Mill, in the Mackay district, and Victoria Mill, on the Herbert River, began crushing, and two years later Goondi Mill, on the Johnstone River near Innisfail, commenced. The associated Victoria Sugar Company in Melbourne, established by Edward Knox in 1857, was a financial partner in the Queensland ventures but the burden of planning, building and organization fell on C.S.R.

In Fiji, also, three mills were established during the first five years of E. W. Knox's general managership. Two of these, Nausori Mill, on the Rewa River near Suva, and a small ancillary mill, Viria, which operated for only ten years, were purely C.S.R. ventures. Rarawai Mill was built by the company in 1885 as a joint venture with the New Zealand Sugar Company, in which C.S.R. and the associated Victoria Sugar Company had a controlling interest.

Chelsea Refinery in Auckland, New Zealand, which commenced refining in 1884, was built by C.S.R. as agents for the part-owned New Zealand Sugar Company. In this instance, also, planning, building and organization fell to the Colonial Sugar Refining Company, which acted as a board of management for the New Zealand company until its amalgamation with C.S.R. in 1888.

The difficulties which E. W. Knox, as general manager, and Edward Knox, as chairman, had to overcome in launching C.S.R. on these expansions are briefly described in the following sections.

To Queensland

The company's entry into Queensland, according to a speaker in the Queensland Parliament in 1881, was "on a scale never contemplated in the North before". To permit the company to acquire land, the Queensland Parliament passed the Colonial Sugar Refining Company's Act of 1881, and C.S.R. undertook to spend £200,000 within five years on the clearing and cultivation of land and the erection of buildings and plant for the manufacture of sugar.

A contemporary description of the Victoria Estate in 1886 gives a

good impression of the revolution which the company's arrival brought about in the Queensland sugar industry. As the ridges were cleared of jungle, the "Fowlers' powerful steam ploughs" turned up the virgin soil with ploughshares and cultivators dragged on steel cables backwards and forwards through the root-entangled earth. There were "scores of ploughmen with their teams" and hundreds of labourers of many nationalities. Seventeen miles of railway line and four locomotives were used to haul the cane to the mill, which was lit by novel incandescent electric arc lights imported direct from the Paris exhibition.

C.S.R. spent £240,000 on Victoria Mill and its transport system and cane plantation, but the board was told in 1885 that "the work was still unsatisfactory and small owing principally to difficulties with machinery, want of steam and laziness of men". When a gold strike occurred on the Johnstone River, the Chinese workers left the mill to seek a quicker fortune. Despite the directors' express instructions that "the closest inspection by the Government officers into the condition and health of their labour shall at all times be courted on all the Company's Estates", the doctors could do little to stop the spread of beri-beri and dysentery among the Kanakas, Javanese, Singhalese, Chinese and Japanese workers. Labour problems harassed the company to such an extent that, in the early nineties, it considered taking a mere £93,000 offered for Victoria Mill by a group of farmers anxious to set up a co-operative mill with government aid.

This undoubtedly was a period of crisis, for the company was being harried by other problems besides that of labour. The Queensland Government proposed a discriminatory taxation scheme for C.S.R. and also levied heavy duties on the machinery for the new mills. In an outburst of frustration and exasperation the chairman, Edward Knox, told shareholders in 1890 that these circumstances would, "when the history of the Company's experience comes to be written, furnish an instructive lesson for those who would venture upon the establishment of any manufacturing enterprise in that Colony".

In New South Wales some of the early plantation owners employed Kanakas and in Queensland they relied almost entirely on coloured labour. Nowhere in the world, except in C.S.R. mill areas in the semi-tropical districts of New South Wales, was cane farming work done by white men. The Queensland pioneers, most of them recent immigrants from temperate European countries, accepted almost without question the belief that white men could not undertake hard manual labour under the tropical sun. Despite their successful establishment of a community of independent white farmers in New South

Wales, the Colonial Sugar Refining Company in Queensland accepted this belief for a decade.

From the start of operations at Victoria Mill in 1883, the company had been buying cane from farmers in the district as well as getting its supplies from its own plantations. This was reported to have been "the first case of farmers growing cane for a mill in the North". In 1884 the proprietors of Habana Estate at Mackay divided a portion of their plantation into farm-sized blocks for renting to farmers. In 1891 C.S.R. subdivided part of the arable land of Homebush Estate in the Mackay district and leased small blocks to farmers with option of purchase "as a possible partial solution to the labour difficulty".

This experiment proved promising and in the following year the chairman announced that it was intended "gradually, as chances occur, to part with the greater portion of the arable land in this way". By April 1893, 5,514 acres of plantation had been divided and leased or sold and already the board was "convinced that this is the system which . . . as in New South Wales will give the most satisfactory results".

Gradually most of the Queensland industry followed the example, by then long-established, of New South Wales, where, according to a Queensland parliamentarian speaking in 1881, the C.S.R. central mills with their surrounding small farms had "elevated [the Clarence River district] out of bankruptcy to affluence". An observer of the Queensland industry could report, in a sugar journal in 1896, "The epoch of small mills and large areas of semi-cultivated land is passing away. The small mills are now very few and far between. . . . Instead of these we now boast some of the largest and most complete factories in the world; in our sugar districts are grouped around these mills the homesteads of settlers who have taken up cane culture. The change is a striking one. . . . White men working for themselves and using the best labour-saving implements are displacing coloured workers rapidly. The large estates are rapidly becoming peopled with small farmers."

This development of working small farms opened the way for the abolition of the plantation system and with it the abolition of coloured labour. There is no doubt that the Kanaka system was always more or less disliked by the young democracies of the Australian colonies, and the developing labour unions, for the protection of their own members, opposed coloured immigration. Under the influence of economic and technological change, the employment of Kanakas in the sugar fields began to decline as the only or dominant system. As has been acknowledged by others, the policy of the Colonial Sugar Refining Company, the largest plantation owner in the north before it subdivided its estates, with much the largest mills, and the producer

in 1890 of one-third of all raw sugar produced in Australia, had a powerful effect and hastened the day when coloured labour would no longer be used.

A parallel movement, originating and developing mainly in the Mackay district where Habana had subdivided its estates, also hastened the change to a white labour basis. This was the idea of co-operative central mills which S. W. Griffith, the Queensland Premier, supported to implement his own programme of removing the Kanakas from the cane fields. As early as 1885, cane growers in the Mackay district petitioned the Government to erect a central mill for the purpose of encouraging independent white farmers. Two large mills, North Eton and Racecourse, were built with the help of a £50,000 government grant and commenced operating in 1888. Griffith expected that these mills would be entirely supplied with cane grown by white men but this proved impracticable at the time.

It is a common Australian myth that the greedy and inhuman planters employed vast numbers of Kanaka "slaves" on their plantations until, at the turn of the century, a newly-federated Australia, in the face of bitter opposition from the avaricious sugar interests, put down this discreditable exploitation of human beings.

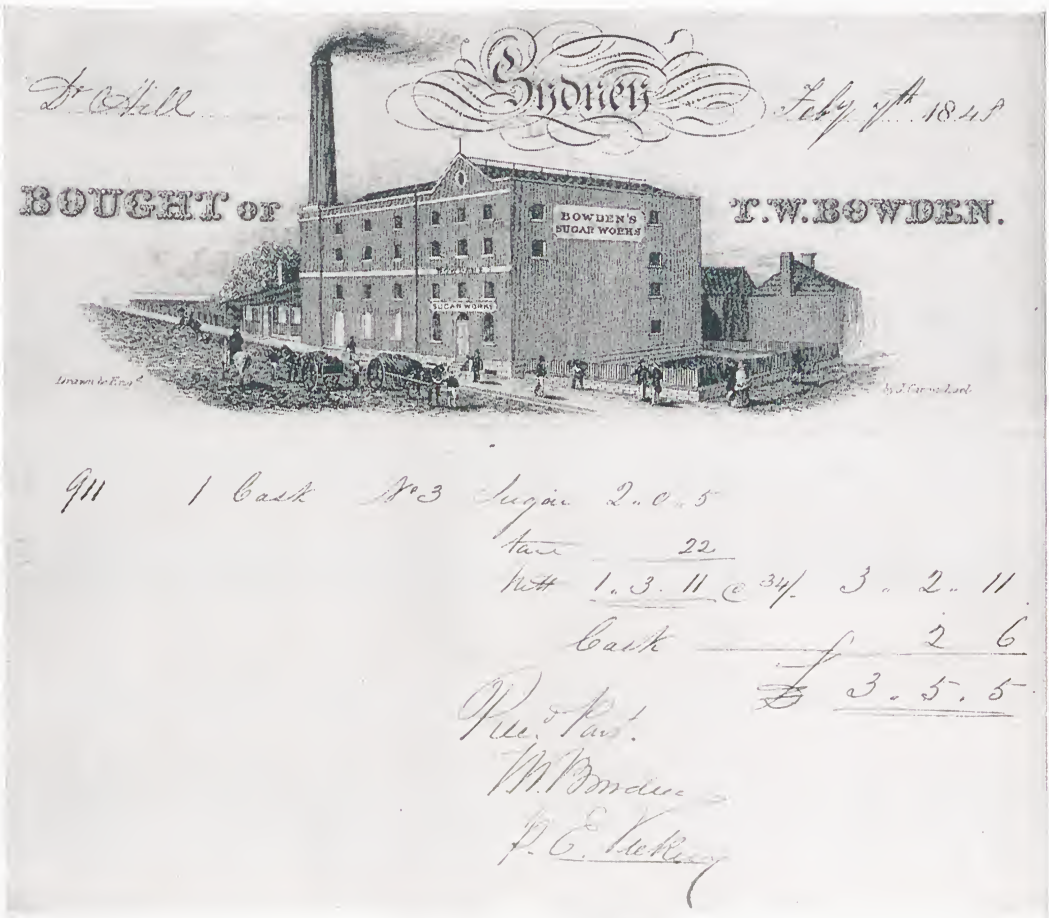
The facts are different. While in New South Wales some planters employed Kanakas, from the very beginning C.S.R., according to a correspondent in the *Sugar Journal and Tropical Cultivator* of December 1893, had "not a single coloured man employed on any of their rivers". Edward Knox told his shareholders that white men could do the work in New South Wales. "We will face the destruction of the industry," he said in 1896, "rather than take part in the introduction of coloured labourers from India or elsewhere." In Queensland C.S.R. employed Kanakas for little more than 10 years, from the early 1880s until it split up its estates in the early nineties. A few islanders remained in the company's employ at its cane nurseries, however, until early in this century.

As early as 1885 the Queensland Government had passed an act which provided that immigration of Kanakas should cease in 1890. But by the time that date arrived even S. W. Griffith was convinced, after a report by a Royal Commission, that the immediate elimination of Kanaka labourers would result in the extinction of much of the Queensland sugar industry. The cessation provisions of the 1885 act were repealed in 1892 but by that time the trend towards white labour and away from Kanaka labour was already manifest. The Kanakas had made a great contribution to the pioneering development of the north by carrying out the arduous work of clearing the tropical jungle

Edward and Martha Knox, from portraits painted in Sydney in 1854 and 1855 by Marshall Claxton. Highly idealized. Both portraits now in Christiansborg, Denmark. *Reproduced from recent photographs taken by John Knox, Ministry of Foreign Affairs, Copenhagen, Denmark.*

Settlers meeting immigrants at Port Jackson during the 1840s, shortly after Edward Knox arrived in the colony. Imaginative rendering of Government House and Fort Macquarie in background. *From a lithograph in the possession of the Sydney University Union.*

The Canterbury sugar works near Sydney, a photograph taken in recent times. This refinery, the first in Australia, was built in 1841 by the Australian Sugar Company, and taken over by the Australasian Sugar Company in 1842.



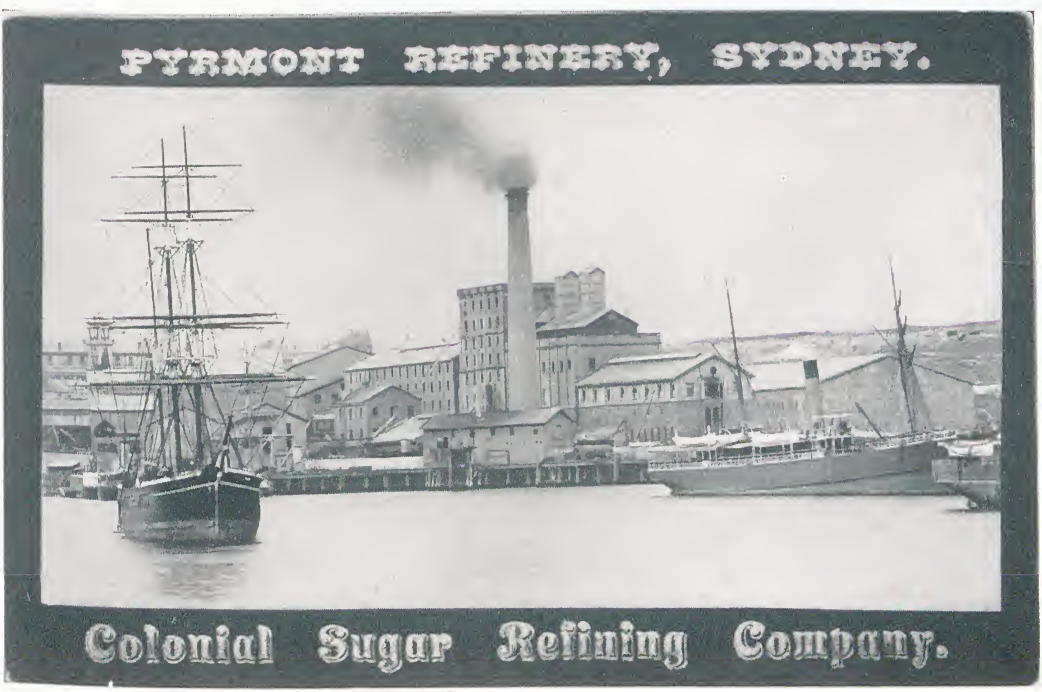
Bowden's sugar works, situated on the corner of Pitt and Liverpool Streets, Sydney, competed with the Australasian Sugar Company's Canterbury refinery during the 1840s. *Reproduced from old billhead dated 7 February 1848—Mitchell Library.*

The seal of the Victoria Sugar Company, which was formed in 1857 by the partners of the C.S.R. Company and a number of Melbourne merchants. Edward Knox was Chairman of Directors. It was amalgamated with the C.S.R. Company in 1887.

The Victoria Sugar Company's refinery at Sandridge, Melbourne, about 1872. When this refinery was burnt down in 1875, the Victoria Sugar Company bought Joshua Bros.' refinery at Yarraville, which had started up the year before. *From old charcoal drawing in possession of C.S.R.*

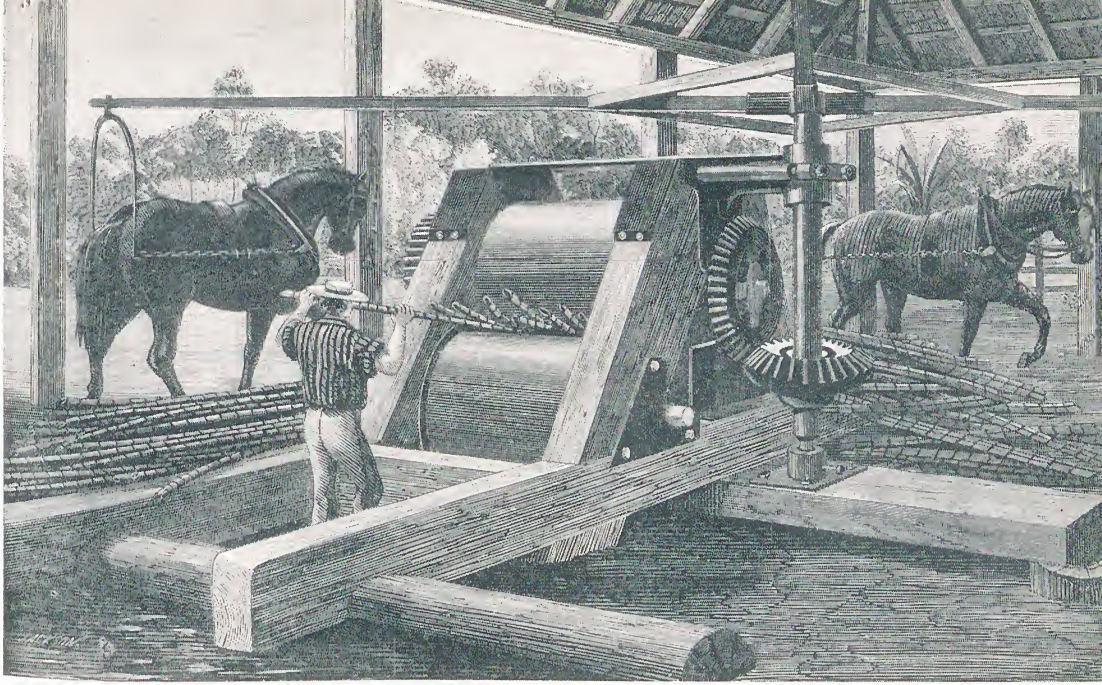
Pyrmont refinery and employees in 1878 shortly after operations commenced.

A price card of 1886 showing Pyrmont refinery.



THOMAS SCOTT, ESQ.

Thomas Alison Scott is often referred to as the "Founder of the Australian Sugar Industry". He is said to have brought Tahitian sugar canes to New South Wales in 1817, and in 1827 made some tons of raw sugar at the Port Macquarie penal settlement. When commercial cane growing and raw sugar production commenced in northern N.S.W. and southern Queensland in the early 1860s many of the early planters obtained canes and advice from Scott. *Portrait reproduced from "Illustrated Sydney News" of 18 February 1869—Mitchell Library.*

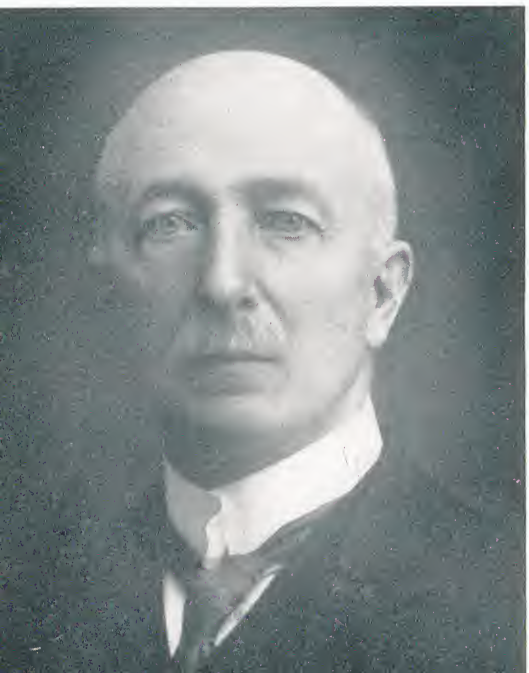


An early cane crushing mill on the Hastings River, northern New South Wales. *From "Illustrated Sydney News", September 1868—Mitchell Library.*

Brewer and Joske's sugar mill and plantation, Suva, Fiji, 1875. *From the "Illustrated New Zealand Herald", February 1875—Parliamentary Library, Wellington, N.Z.*

E. W. Knox in his twenties, when he was superintendent of the Clarence River Mills.

Dr Gustav Kottmann, a German beet sugar chemist, engaged in 1883.



T. U. Walton, a Scottish sugar refinery chemist, engaged in 1881.

Victoria Mill, in 1883, when it commenced operating. The company's new mills in the 1880s were far larger than the small plantation mills then common in Australia and Fiji.

Seedling canes at the C.S.R. Co.'s Hambledon Mill, 1902. Trials of various canes were carried out at C.S.R. mills from 1886, and in 1891 experimental canes were successfully raised from seed (as distinct from cuttings).

Sir Edward Knox addressing employees at the Pyrmont Refinery picnic, 1894. Refinery manager James Muir, at right.

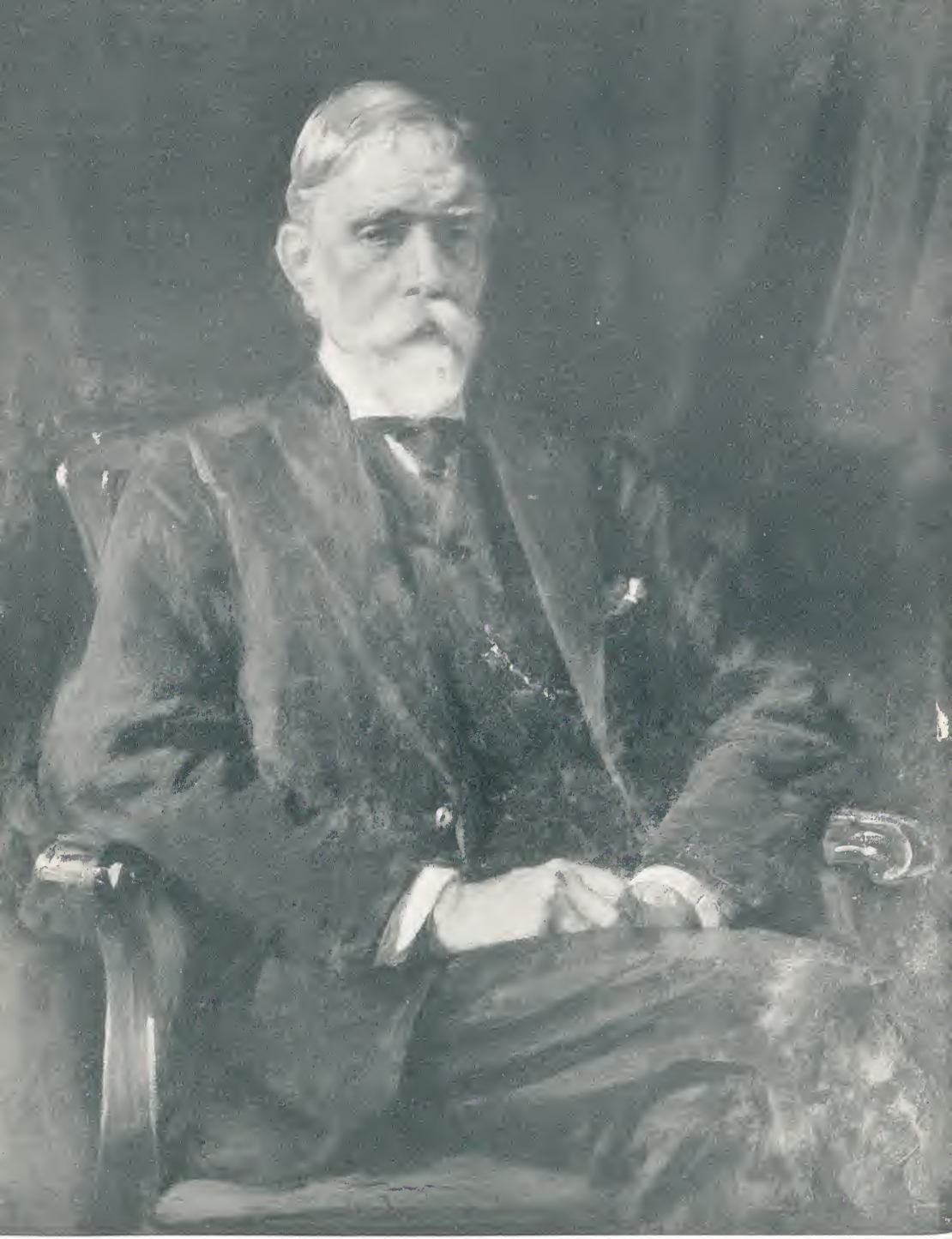
H. E. Kater, Chairman of the Board, 1901-1920.

W. H. Rothe, General Manager, 1920-1923.

H. V. Dixon, General Manager, 1923-1928.

P. H. Goldfinch, General Manager, 1928-1943.

C. W. Rothe, General Manager, 1943-1951.



E. W. Knox in his old age. *From a painting in the Union Club, Sydney.*

and getting the land under cultivation. By the turn of the century the jungle was under control and the industry was established. Much of it was already operating on a white labour basis, though many of the small farmers who took over the subdivided plantations used one or two Kanakas to help them. While considerations of conscience and humanity played an important part in the extinction of the Kanaka system and while the decisions of the new Federal Parliament hastened the change and ameliorated the consequences, the main reason for the decline in coloured labour was economic. Hoe culture was giving way to plough culture and the white man was proving a more productive worker, even in the tropics.

To Fiji

"Sugar will be produced in Fiji sooner or later which will come into competition with ours;" E. W. Knox wrote in 1879 when he was superintendent of the Clarence River mills, "it is a question whether it will not be better for us to take a share in the development of the industry and the profits that will be realized."

Knox had only just taken up his post as general manager when one of his New South Wales mill managers returned from Fiji, where he had been sent to look for a suitable site for a mill and to investigate offers of local planters to supply cane. This officer reported that he had obtained contracts from planters to supply over 70,000 tons of cane to a mill during the 1882 season. The company's board decided to order "the machinery at once for a factory equal to working that quantity".

Knox's organizing ability and his experience on the Clarence were of great value in the new venture. The *Sydney Morning Herald* reported:

> The Colonial Sugar Refining Company has entered upon an undertaking of great magnitude, for the purpose of developing the sugar-growing resources of the Fiji Islands. Their scene of operations is on the Rewa River, about twelve miles from the ocean, where a considerable area has been planted with young cane during the past few months. Before long there will be a small colony of Europeans and natives in the employ of the company. . . . The steamer *Fiona* leaves Sydney immediately with twenty mechanics and about sixty labourers, to commence the work of erecting a large sugar mill on the banks of the Rewa. The steamer is loaded with plant and stores, including materials for the construction of houses, piles for wharves, and a pile-driving machine; also a steam launch for towing lighters etc. . . .

The new mill was Nausori, near Suva, and the *Fiona* was the company's ocean vessel.

It was decided not to depend entirely on "purchasing and crushing the farmers' cane in the same way as they do on the Clarence and Tweed Rivers" but to grow a proportion of cane for the mill on company estates in Fiji. "On the whole, I am well satisfied with our prospects;" Knox reported after a visit of inspection in 1881, "unless the cane from some causes should prove very inferior . . . we should have no reason to be disappointed with the result of our venture."

Results were not, at first, to prove as satisfactory as Knox optimistically hoped. Nausori is a very wet part of Fiji and the cane was not as sweet as in New South Wales. The Rewa River flooded and damaged the growing cane, and then dried up in the summer heat so that the punts bringing the harvested cane to the mill stuck in the mud. The coloured labourers succumbed to European illnesses. But, despite these disappointing results, it was decided to set up another mill on the "dry" side of the main island. In 1883 Knox, on another visit to Fiji, reported that "the planting of the cane nurseries and the erection of labour houses etc., which had been commenced, was being pushed on . . . suitable sites for the mill and the surrounding buildings have been selected . . . the plan of the mill is being prepared and will be sent to England at once."

The Rarawai mill was built in a remote area across the mountain backbone where "the only reliable means of sending a letter to the Rewa is by a special messenger, at a cost of £1, a week being necessary for the trip". But it was accessible by ship and Knox eventually thought it to be "decidedly the best and most conveniently arranged of all our factories". The new mill commenced crushing in 1886.

The early troubles and difficulties in Fiji were gradually overcome and the two mills proved a worth-while investment. In 1891 it was proposed to move Victoria Mill from Queensland, where the company was experiencing difficulties with labour, and re-erect it at Lambasa on the other major island of the Fiji group, Vanua Levu. When it was decided to retain the mill in Queensland and to split up the plantations into farms, new machinery for the Lambasa mill was ordered from Glasgow. The new mill began operations in 1894.

A few years later, in 1899, the company announced that it proposed to lease a tract of 8,000 to 10,000 acres from the native Fijian owners and to build a further mill at Lautoka which would be "the greatest in the southern hemisphere". This mill began operations in 1903.

Penang, the fifth mill to be operated in Fiji by C.S.R., was bought in 1926. It had been established by a planter, Dr Chalmers, about

1878, just before the company had come to Fiji. It was one of the few small mills to survive the slump of 1884, which affected the Fijian sugar industry as drastically as that of Australia.

As had been the case in Queensland, the early pioneers used coloured labour for field work on their cotton and sugar plantations in Fiji. Local Fijians and imported Polynesian workers gradually gave way to Indians after the British Government in 1877 authorized the shipping of indentured Indian labourers to the new colony. "Under the plan adopted, volunteer migrants were recruited by agents in India, and in due course signed a contract to serve in Fiji for a period of five years on any plantation to which they should be assigned, the cost of their introduction being paid by the plantation owner. At the expiration of the stipulated term the migrants were free to work where and for whom they pleased; and after five more years, of free labour, they and their families were entitled to a passage back to India if they chose to return."

C.S.R. was from the early days the largest employer of Indian immigrants, but it was not responsible for the system, nor was it peculiar to Fiji. It had been in operation for more than forty years in other British colonies before it was introduced to Fiji by Sir Arthur Gordon (later Lord Stanmore) who had been previously governor of Mauritius where Indian migration had commenced in 1834. Soon after his arrival in Fiji in 1875 Gordon recommended Indian migration to Fiji. He saw in the planters' demands for labour a danger to the stability of the indigenous Fijians' social system. "I utterly objected to the measures by which they wanted to force the native population, who were almost all owners of land themselves, to come and work on estates . . . and I proposed the Indian immigration. It was enormously opposed by the planters at the time. . ." (Evidence to Committee on Emigration from India to the Crown Colonies and Protectorates, 1909-10). In order to put his proposals into effect Gordon sent his agent-general for immigration to India in 1877, and as a result of his negotiations the first migrant ship arrived in May 1879. The next year, 1880, C.S.R. bought its first land in Fiji, on the Rewa River, and commenced clearing with Pacific Islanders. E. W. Knox welcomed government arrangements to bring more Indians to Fiji because they provided an opportunity to "have nothing more to do with Polynesians. . . . the trade is, to say the least of it, a disagreeable one, and I should certainly prefer to leave it alone." Thus in Fiji, as in Queensland, the company at first accepted the existing social structure of the sugar industry as it found it, but to Fiji also it brought new attitudes and new techniques which were gradually to bring about changes of great significance.

In 1908 the chairman told shareholders, "We are continuing the policy of leasing portions of the land hitherto cultivated by ourselves to officers who have been for some time in our employ, and we hope thus to dispose of a considerable area in the next few months. It is manifest to us that the land and labour are in this way worked to a greater advantage and, although we have some loss of profit, the business is put on a sounder and more enduring basis."

In 1916 emigration of Indian labourers to Fiji was terminated and in 1920 all existing indentures were cancelled. There were acute labour shortages and industrial troubles, followed by a sudden and disastrous slump in sugar prices. The company and the independent planters were not able to work their estates. E. W. Knox was by that time in his seventies and apparently viewed the position of the industry in Fiji with deep pessimism. While he undoubtedly gave approval—reports suggest somewhat grudgingly—it was left to the initiative of younger men in the company's service to introduce, in Professor Shephard's words, the "bold experiment" of small farm growing of cane by Indian tenant farmers.

The small-farm system, introduced in 1924, ultimately proved successful. A new generation of C.S.R. men had brought into being in Fiji agricultural communities similar to those E. W. Knox had helped to establish in New South Wales in the 1870s and in Queensland in the nineties.

Applied Science

In 1884 a great slump hit the sugar markets of the world. Raw sugar prices per ton fell from £21 sterling in 1882 to £13 sterling in 1885 and continued to fall gradually. Knox expected a profit of £200,000 for 1884, but the actual result was a deficit of £100,000. Payment of dividend ceased for 18 months and Knox was faced with the possibility of the destruction of the organization his father and he had built.

A modern historian has suggested that it is adversity rather than prosperity which stimulates achievement and that progress and development occur as responses to difficult situations. Edward Knox had responded with sustained vitality to the situation of 1857 and his son responded with equal vigour to the challenge of 1884. The father's response was primarily financial and commercial; the son was now to add a technological response of great importance.

The elder Knox applied his trading and financial abilities to the conservation and increase of the company's capital resources. He bought his

raw sugar on the markets of the world and savings were measured by him primarily in terms of money. E. W. Knox manufactured raw sugar and he came to think of conservation of resources in terms of the sucrose in the cane, which was costly either to produce on one's own plantations or to buy from farmers.

This attitude of thought was to bring about great changes in the raw sugar industries of Australia and Fiji where much of the sugar in the cane was being lost during the process of manufacture. It was also to bring about great increases in the company's fortunes for, in the end, the value of the sugar saved in manufacture and later marketed was expressed in the account books in impressive financial terms.

There were a number of reasons why the company survived the 1884 slump and the prolonged period of depression which followed, but three factors were of vital importance. The policies of Edward Knox had placed at its command considerable resources of capital. The company's mills were of an economic size. In addition, from the mid-seventies onwards, the Knoxes were among the first cane sugar manufacturers in the world to seek to apply the science of chemistry to the company's factory processes. These three factors—adequate capital, large-scale production and applied technical and scientific skills—combined with the genius for management possessed by the Knoxes were responsible for the survival of C.S.R. when other sugar manufacturers with limited funds, small mills, and comparatively inefficient methods of manufacture were ruined.

When the Colonial Sugar Refining Company started to make raw sugar in New South Wales it was "absolutely without experience" in this new field. Sugar refining, its main business, was at that time more an art than a science. "There was no book on sugar analysis in the English language" and progress in the new venture depended on Knox's ability to master by trial and error the technicalities of milling and the mysteries of agriculture. But E. W. Knox was not a man to wander aimlessly round the periphery of a problem. He quickly came to realize that the success of sugar milling depended primarily on two things—an assured supply of cane rich in sugar and the extraction of the maximum amount of sugar from that cane.

The company kept abreast of developments abroad. Knox returned from his visit to the West Indies in 1877 with knowledge of the latest developments in milling technology. He introduced double sets of rollers in the company's New South Wales mills and obtained a much higher extraction of sugar from the cane. In 1873 Sir Daniel Cooper,

one of the original partners of the company, wrote from London to Edward Knox:

> I hope by the aid of Professor Smith that you will work the polariscope, and with the help of the other chemist inform yourself as to the component parts of the juice and syrup, so that you may know exactly what enemies you have to contend with. If you once know this I feel certain your work will be greatly facilitated and success will be sooner attained.

About 1879 the company "was led by the great attention then being paid to chemical research in connection with the beet sugar industry [in Europe] to commence such investigations into our mode of work". As Knox said in 1890: "We did not know clearly what we wanted nor did the man we engaged, so the first start was not a success; but it showed us we were on the right track, and we accordingly engaged in Scotland a refinery chemist and a year later two beet-sugar chemists in Germany, and began the systematic check on our working. Of these gentlemen the former is now our head chemist (Thomas Utrick Walton, B.Sc., F.I.C., F.C.S.) and one of the latter our inspecting chemist (Gustav Kottmann, Ph.D.), and it is to the patience and industry of these two gentlemen that much of the success we have achieved is due."

Little is recorded of the work of the company's first chemist, but Walton, the Scot engaged in 1881, and Kottmann, the German engaged in 1883, set to work and evolved methods of sampling cane and methods of analysis of cane and intermediate products. Walton's instructions were "to find out if the waste fibre contained sugar, and if so how much. . . . At this time double-crushing was considered to be the last word in cane sugar manufacture, and mill managers confidently stated that all sugar was taken out of the cane—the usual test being to suck a piece of megass." Walton's assistants found some 7 per cent of sugar in the megass but the mill managers accused them of talking nonsense. "If they find sugar it is there," Walton retorted, "the polariscope cannot lie."

In 1884 Knox wrote to the mills, "The great fall in the value of sugar which has taken place this year has forced upon our attention in a very unpleasant way the necessity of improving our work and reducing our expenditure to the greatest possible extent, and I wish now to direct the attention of our managers to some details of the work in which savings of some importance can be effected." He then went on to say that the company had decided to "commence a system of chemical book-keeping in regard to the work of the mills".

Although far-reaching in its consequences, the system was simple in broad concept. It involved measuring, by chemical analysis, the amount of sucrose in the cane as it entered the mill; the sucrose in the juice and syrups at various stages of the process; and the amounts of sucrose leaving the mill—as raw sugar, retained in the cane fibres, in an unrecoverable form in the residual syrup known as molasses, and in other ways. By comparing input of sucrose with output, losses during processing could be determined. The records of continuous analyses provided data from which could be compiled, in terms of sucrose, periodic profit and loss accounts and balance sheets.

This system, started in 1882, was put into full effect at the mills during the 1885 season. It is difficult to know whether this was the first full and formal method of measuring the chemical work on the sucrose entering the cane mills of the world but it seems likely that it was. Certainly it was a great advance which gave C.S.R. a long-sustained advantage in Australia and Fiji.

In 1886 Knox visited Europe and inspected beet-sugar factories in Germany. This experience strengthened his conviction that the lines on which he had been working for several years were sound. Part of the reason for the slump in sugar was the technical efficiency of the German chemists, which had allowed them to increase output and to lower their costs. Knox reported to the Board: "The extraordinary success achieved is almost entirely due to the union of science and practical skill which is manifest in every detail . . . We cannot do better than follow the example of our German competitors in making chemical research their main standby in all their operations."

One result of his observations was that the chemists were given more responsibility in the control of manufacture. Knox was firm but tactful in advising his managers of this new policy. "I therefore wish", he wrote, "that to the chemical staff be entrusted the oversight and, to a certain extent, the control of the manufacture from the rollers to the packing of the sugar. The Managers will, as hitherto, have the regulation of the work entirely in their own hands . . . but they will be expected to give effect to any reasonable requests of the chemists and be guided by their advice in all questions relating to the treatment of the juice, sugar and syrups. . . . It will, of course, be necessary to arrange that there shall not be any divided authority. . . ."

Kottmann between 1885 and 1888 devised a formula to assess from the weight and analysis of the cane the amount of sugar a mill should obtain from it. This formula, conceived in terms of "an unconquered margin to stimulate efforts towards further improvement", was known

as P.O.C.S. (Pure Obtainable Cane Sugar) and, together with an associated Co-efficient of Work formula for the mills, formed a most important additional element in the control exercised by C.S.R. chemists over the mill manufacturing processes. These formulae also allowed the efficiency of mills to be measured and compared, irrespective of the different qualities and varieties of the sugar cane which they were handling.

Because it stimulated the growing of canes rich in sugar the P.O.C.S. formula was to become of even greater importance in its long-term effects when payment to the farmers was established on a basis of the recoverable sugar content of their cane. With sweet canes many costs are reduced: cultivation costs per ton of sugar in the field, harvesting costs per ton of sugar, cost of transporting to the mill the sugar in the cane, and cost of crushing the cane. Moreover there is less cane fibre to retain residual quantities of sugar. Some of these advantages are not great individually but, in total, they are significant.

The importance to the mills of full crops of clean sweet cane had been early recognized by Edward Knox. Before any of the company's New South Wales mills were built he instructed Melmoth Hall to carry out experiments to find the best time to harvest cane. Hall showed that "richness of cane in saccharine matter" depended not only on the age of cane but also on the period of the year at which it was cut. "The plan originally contemplated by the Sugar Company", he wrote in 1874, "was to pay for the cane on a scale proportionate to the quality of the juice. . . . Those were the terms offered to the farmers by myself, on behalf of the Company, in 1868. But the plan was found impracticable" because the technical method of measuring the sugar content proved unreliable. But C.S.R. did not forget the idea and in 1899, armed with the P.O.C.S. formula, introduced the concept of paying for cane on its sugar content. It was adopted by some other mills in due course, and by the whole Australian raw sugar industry from about 1916 onwards.

In 1890 E. W. Knox gave an address to the Australasian Society for the Advancement of Science. His paper, reprinted as Appendix 5, shows the quality and progressiveness of his thinking. In it Knox describes the function of the chemist in the company's organization, deals in some detail with the scientific methods used and explains the way in which observations are recorded and translated for use by the managers in improving methods, minimizing waste, and increasing profits. He deals frankly with the problems which arose when the scientists were introduced into mills and refineries and speaks warmly of the advantages which accrued by "having, in a large service

like ours, men trained in the knowledge that their work is useless unless it is carried out with patient thoroughness accompanied by uncompromising truth-telling".

This address of E. W. Knox reveals the thinking of a man who set a pattern of organization which, in many essential respects, still operates after 65 years of growth and development. In reprinting it in the *Proceedings of the Royal Australian Chemical Institute* for May 1954, the editor comments: "We venture to think that few readers would guess without assistance that this modern scientific lecture was delivered by a non-scientist in January 1890!"

In 1910 E. W. Knox stated: "The chemical check . . . applied since 1882 under very competent control has brought about marked savings, and the consequent lowering of our cost of production has aided us greatly in surmounting the many difficulties and the two serious crises in the sugar market we have had to face within that time. And thus strengthened, we are ready to meet competition from any quarter with untroubled minds."

Over the years C.S.R. chemists and engineers have made a number of major contributions to the advancement of sugar technology which have been applied in its own factories and have gradually come into widespread use. The sum of the further savings effected over the years is great. In the early years of the present century an overseas expert in fuels and boiler efficiencies was engaged. For many years a heat balance, comparable to the earlier sugar balance, has been regularly used in the company's factories.

The man who played a leading part in training and guiding those who were to apply and refine the scientific methods was Thomas Utrick Walton, Chief Chemist from March 1881 until he died aged sixty-four in 1917. He was something of a confidant of Knox and without him it is doubtful if the full advantage would have been derived from Knox's basic drive and from Kottmann's imagination and great technical competence.

Walton was a man of ability and character, possessed of a keen intellect and ardour for truth. These qualities he impressed upon his pupils, for the training of the young chemists became one of his particular cares. He was responsible for the chemical system in the refineries and for ensuring that the chemical sections of all the factories were well staffed. He concentrated on building up a technical staff strong in character and tradition as well as strong technically. He was friendly and kind by nature, a born teacher, and his young chemists looked to him for guidance and advice in many matters. The staff he "fathered" and taught constituted a unique cadre in the South Pacific

until similarly trained staffs were built up in more recent times by other companies.

* * *

Attention to the standard of agricultural practice and the sweetness of cane had been important considerations with E. W. Knox from his first experiences on the Clarence River and progress in these directions was linked intimately with scientific progress in the factories. In his review of the 1872 season's work, he reported: "The conviction is forced upon me that there is no loss by good farming, and that money spent in improvements such as manuring, draining etc., is well laid out and will in due time give a handsome return." On his suggestion it was decided in 1873 to give prizes up to £50 each (a substantial bonus in those days), to an annual total of at least £1,000, to farmers on the Clarence whose cane "bears evidence of the most efficient and careful cultivation".

Some years later, in 1880, he commented on the Clarence River farmlands that "even with the best cultivation a continual cropping without any adequate return of plant food to the soil must gradually result in its impoverishment . . . and in the end what has been taken from the soil must be returned to it". Knox either stimulated Kottmann to work on this problem or welcomed his native interest. In addition to the P.O.C.S. formula and chemical book-keeping in the mills, Kottmann devised and supervised field experimental work. In advocating trials with a few clumps of cane in nurseries, he suggested that "these trials take the place of scouts in warfare who are sent where it would be impossible or impracticable to employ larger bodies of troops".

His scouts reconnoitred many new fields, some of them extremely profitable. In 1885, in the first agricultural circular signed by him and sent to the Nausori mill in Fiji, Kottmann gave directions for trials to be made with superphosphate and sulphate of ammonia. Soil analysis was started in 1886 and in the same year he wrote: "It is a matter of greatest importance that we should increase our knowledge in regard to the varieties of cane which are the most profitable to cultivate and the conditions under which they grow best, both as to quality and quantity." The result was the establishment of a small cane nursery at Harwood Mill in 1886, and a small area was also set aside at each of the mills for experimental work. Green manuring with cowpeas and vetches was started in 1888.

All this original and near-original work by Knox, Walton and Kottmann represented a remarkable achievement in the context of the times. It was the more remarkable for the speed, precision and

decisiveness with which it was conceived, worked out and put into full practical effect. This was made possible by the early realization that an advisory service must be provided to transform the results of research into practical application by the farmers, and that service was available in the close contact between the mill field staff and the farmers, between whom there has always been close co-operation. Although spectacular advances were being made in other fields in the rest of the world there was little comparable scientific research and application being carried out in the young, undeveloped and remote Antipodes. About this time Java was starting to establish in cane fields and mills her standards of technology which later became famous, but the early efforts in Java and by C.S.R. were quite independent of each other.

In 1889 Knox sent Kottmann to Mauritius and Java to study the cultivation of cane. Kottmann's observations and recommendations as a result of this trip gave a further impetus to C.S.R. agricultural research in the succeeding years, although nothing new in factory techniques seems to have developed out of these visits. He was a keen observer and a meticulous recorder and, even though he had some trouble at times with the niceties of the English language, he could make his meaning clear. The rough terrain in Mauritius, he reported, did not "allow of much display of the fertilizing steel drawn by quadrupeds or steam".

The world's first industry-based sugar experiment stations were those of Louisiana and Java, started in 1885 and 1886. Deliberate seedling raising had commenced in Java and the British West Indies in 1889-90 after the discovery that the cane plant produced fertile seed. From this stimulus, the company started cane-breeding in 1890. In 1893, in co-operation with the New South Wales Department of Agriculture, successful work commenced on the control of gumming disease, a severe threat which forced the closure of several small mills not owned by C.S.R.

Noel Deerr did not know of the Colonial Sugar Refining Company's record in the sphere of factory and field technology (which has not been given full public documentation), but we can put it in perspective by quoting from his *History of Sugar*, where he gives instances of contemporary developments in other countries: "The first organized work was that begun in 1880 by Bonâme in Guadeloupe, who also in 1893 organized the Station Agronomique in Mauritius. Harrison began work in Barbados in 1884 and in 1890 moved to Demerara, where he conducted a notable series of manurial experiments besides giving the sugar industry its first successful seedling canes. The sugar

experiment station at Audubon Park, New Orleans, was founded in 1885 under the direction of W. C. Stubbs, and that of the Hawaiian Sugar Planters' Association in 1897 under Maxwell, who also initiated experimental work in Queensland in 1900. . . . The Java Stations . . . began work in 1886 and 1887."

Noel Deerr's reference to Maxwell's work in Queensland in 1900 recognizes the establishment of the Queensland Bureau of Experiment Stations, but we have shown that C.S.R. was far ahead of the rest of the Australian sugar industry in applying scientific methods to its work in factory and field. In the factory it was also probably far ahead of cane sugar industries in the rest of the world, with the possible exception of Java.

It is worth noting the similarity in time and nature between the company's work and what was happening in Java. Quoting again from Deerr: "Of the period 1896-1912 Mr H. C. Prinsen Geerligs, one of the most distinguished of the many Dutch technicians who have benefited not only Java but the whole sugar world, has written with pardonable pride:

> Java was struck by two calamities, which brought the sugar industry to the verge of ruin. The enormous beet-sugar production caused the price of sugar to go down considerably in 1882-4, so that it fell eventually below net cost price. At the same time a mysterious disease . . . attacked the cane plantations and did great harm. . . . The sugar manufacturers, oppressed by two evils, did not lose courage; they put considerable capital into their industry and invoked the aid of science to help them improve their cultivation and manufacturing methods. Three experimental stations were founded, for the purpose of combating the sereh disease, which have done good work outside their original scope and which have given useful information as regards planting and manufacturing methods, chemical analysis and control, and even now as regards mechanical installation of factories. Capital was provided by the Dutch capitalists and invested in the calamity-stricken area, science was practically applied and the estates were managed in an economical, rational and energetic manner. The praiseworthy combination of energy, science and capital not only saved the Java sugar industry from utter ruin but also placed it among the foremost sugar producing countries, so that for years Java has been an example to other countries, who recognize it to be expedient to carry on the sugar industry in a scientific manner. . . "

The C.S.R. story over this period has many points of fairly close correspondence; it seems that Java pioneered in some fields and C.S.R. led the way in others.

The Growth of Refining

The old Canterbury refinery, built by the Australian Sugar Company and operated by the Australasian Sugar Company from 1842 to 1855, was not taken over by C.S.R. It was too far out of town. Two other refineries had been built in Sydney during the 1840s by independent entrepreneurs. C.S.R. bought one, the "Brisbane House" in Parramatta Road, to commence its operations and the other, Bowden's works in Liverpool Street, a year later "in case of accident to the Brisbane Refinery". Production for the first year was, according to board minutes, "324 tons of Loaf, 2,087 tons of Crystals and Snowdrop, 1,503 tons Pieces, 1,155 tons Molasses". In those early days the company also bought Robey's refinery on the north shore of Sydney Harbour. The cost of "putting down opposition" loaded the company with debt for many years and burdened it with several unproductive properties.

In 1857 the partners of the Colonial Sugar Refining Company, as previously mentioned, decided upon the formation of an associated company in Victoria. Edward Knox visited Melbourne to choose a site for a refinery and to persuade a number of Melbourne merchants to join in the new venture. The Victoria Sugar Company was formed under deed of settlement dated 1 June 1857 and a refinery was built at Sandridge, now Port Melbourne. The new company suffered, as did its sister company in Sydney, from the slumps which followed.

In 1874 a large refinery at Yarraville, built by the firm of Joshua Bros. "of London and Melbourne", seriously competed with the Victoria Sugar Company's Sandridge refinery. The next year the Sandridge refinery was burnt down. Edward Knox hurried to Melbourne and bought Joshua Bros.' refinery on behalf of the Victoria Sugar Company, thus achieving elimination of competition and continuity of production in one coup. The company also acquired, besides a brand new refinery, another valuable asset—James Muir, an engineer, who had built refineries in Scotland and England and who had come out to build the refinery for Joshua Bros. Muir subsequently built for C.S.R. the Pyrmont and Chelsea refineries and Broadwater Mill on the Richmond River in New South Wales, at the time the biggest mill in Australia.

The Victoria Sugar Company, half-owned by C.S.R. shareholders, was a financial partner of the Colonial Sugar Refining Company in the

expansion of the early eighties. It helped to provide a share of the new capital needed to build mills in Queensland and in Fiji and a refinery in New Zealand. From 1882 onwards the Victoria company experienced considerable financial difficulties and the idea of full formal amalgamation was discussed. In 1887 the arrangement was carried through and E. W. Knox became general manager of a still bigger company, this time on a footing of limited liability. The old Colonial Sugar Refining Company of Edward Knox had become the Colonial Sugar Refining Company Limited of modern times.

The next year a further consolidation was effected. In 1883 C.S.R. and the Victoria Sugar Company had decided to form the New Zealand Sugar Company with one-third representation for local New Zealand interests. Edward Knox, then chairman of C.S.R., had visited New Zealand in 1881 and purchased land for a refinery, and James Muir was already proceeding with its erection before the New Zealand Sugar Company was formed. The New Zealand investors later found it difficult to raise sufficient funds to finance expansion into Fiji and in 1888 the Colonial Sugar Refining Company Limited absorbed the New Zealand company.

C.S.R. now had three large modern refineries at work. The old Brisbane House had been closed down and a new refinery at Pyrmont in Sydney had commenced operations in 1878. The 1880s were a boom period in the Australian cities despite the slump of raw sugar prices which brought ruin to many in the cane districts. By the end of the eighties it was necessary to enlarge the capacity of the Pyrmont, Yarraville and Chelsea refineries. It was decided also to extend refining operations to South Australia and Queensland; operations commenced in 1891 at the company's Glanville refinery in Adelaide and in 1893 at the New Farm refinery in Brisbane.

In Queensland there were several attempts to establish refineries in cane districts. In 1870 Messrs Tooth and Cran, owners of the Yengarie sugar mill in the Maryborough district, built a plant to refine limed cane juice purchased from farmers. The plant was closed down some years later when Robert Cran moved to the Bundaberg district, where he took a leading part in the establishment of the Millaquin refinery in 1882. Bingera Mill, also at Bundaberg, operated a small refining plant for about three years from 1889 but ceased refining to concentrate on milling.

In Victoria a number of refineries were built at various times but only one survives today. Various beet-sugar projects have also been started but all eventually failed. Joshua Bros.' refinery at Yarraville, built in 1874 and bought by the Victoria Sugar Company in 1875,

has already been mentioned. The Rosstown Sugar Company was formed in 1881, but from the scanty available references it does not appear to have had a long or prosperous career. In 1886 a small refinery was established in Melbourne by the Poolman family. It operated until 1907 when it and another small Poolman refinery in Sydney were bought by C.S.R. In 1891 a group of wholesale merchants started a refinery in Melbourne, operating as the Australasian Sugar Refining Company (not to be confused with Sydney's Australasian Sugar Company of 1842-54). In 1894 Edward Knox, the chairman, told shareholders of C.S.R. that "when the population of Melbourne began to diminish, and the prevailing depression made itself acutely felt, the impolicy of maintaining two large refineries, under separate management and administration, where one establishment was capable of supplying the entire demand for refined sugar, forced itself upon the attention of the two companies". Negotiations for amalgamation commenced and resulted in C.S.R. purchasing the business for £104,000, thus "doing away with a competition that has proved troublesome and unprofitable to both companies".

Under Knox and Walton the chemists were cutting down losses and minimizing waste in the refineries as they were in the mills. Competitors found themselves in a difficult situation. The main processes of sugar refining have been established for a long time but modifications of plant and technique can produce improvements and economies which, though separately small in themselves, have a very considerable cumulative effect. The story of the slow, unspectacular achieving of progressive increments in refining productivity is not simple to tell and, in its complexity, has to be written by the expert for the expert. The end result for the company was reflected in E. W. Knox's confidence, which he proved to be well founded, that he could undersell any competitor. In fact his prices were lower than those of the much larger and long-established London refiners.

Politics and Opinions

After the purchase of the Poolman refineries in Sydney and Melbourne in 1907, C.S.R. shared the Australian refined sugar market with only the Millaquin refinery in Bundaberg, but this situation involved continual watchfulness and appropriate adjustment of prices to keep out large imports. At that time Australia had little secondary industry and the refineries of C.S.R. stood out as impressively large factories on the skylines of the capital cities. The company was the biggest industrial organization in the Commonwealth. There was,

however, little appreciation of the reasons for its success; of the constructive part it had played in shaping an industry; of its intensive use, ahead of its time, of modern scientific and mass production methods; of its enlightened policies in respect of growers and employees. E. W. Knox and his board were prepared to make explanations, of the cold and distant kind, but were disdainful of publicity.

Bigness and success, as usual in our democracies, attracted the attention of a certain type of politician. When, in 1910, Chairman H. E. Kater told shareholders "the substitution of shareholders' capital for borrowed money . . . and the chemical check" were "the real reasons for the success of our company", he found it necessary to add "not, as some would have you believe, the acquisition of money by wrongdoing and robbery, but only by careful and laborious application over a long period of fundamental rules so often neglected by manufacturers". Referring to an outburst of parliamentary criticism he said, "We have not thought it necessary to make any reply . . . refining is called a monopoly which deserves to be crushed, though every distributor is free to draw his supplies from Hong Kong, Java or elsewhere . . . white sugars are not imported to any extent because we undersell our friends in the East, and we intend to continue to do so."

"Monopoly" was not an exact description when applied to the company's refined sugar business because, as E. W. Knox stressed, anyone could, and some did, import refined sugar without hindrance; but that did not prevent the term being used. Knox regarded those who hurled it into controversy in a spirit of opprobrium much as a dignified old gentleman might regard name-calling, naughty little boys. Those who cried "monopoly" most were, however, not entertaining themselves—they were playing the very serious game of politics.

The windmill-giant of the "C.S.R. monopoly" has provided good tilting for the Don Quixotes of Australian politics for more than half a century. William Morris Hughes in later days enjoyed admitting to E. W. Knox that, when he was badly in need of some additional income in the early 1900s, he could always depend on the Sydney *Daily Telegraph* of those days to pay him well for, as he himself put it, a few "pithy paragraphs" on the iniquities of C.S.R. But E. W. Knox's sense of humour was not his strongest point, and he felt bewildered when it was suggested that Australia needed rescuing from the company.

Described by a contemporary as a man of "unswerving rectitude", he hardly suspected, once an explanation had been given in the public report to shareholders, that his motives could be questioned, except by knaves or fools. When the company became a subject of political

contention about 1905 he was sincerely distressed. Its record afforded only deep satisfaction, for prosperity to him, as to the ancient Israelites, was the outcome of virtue: "He that gathereth by labour shall have increase."

Knox regarded reinvestment of carefully conserved earnings in modern and efficient refineries as wholly praiseworthy. He could not understand that the company's emergence as virtually the only refiner of sugar in Australia and New Zealand should be regarded as in any way undesirable or sinister. True, it had partly achieved its position by buying or amalgamating with competing refineries but their owners were not inadequately compensated. Most had been paid in C.S.R. shares and had done quite well in their deals with the larger company.

It was obvious, Knox considered, that excess competition in sugar refining could benefit neither competitors nor consumers. Two small refineries could not produce as cheaply as a single large one. The bigger unit of production could take advantage of efficient, large-scale processes and specialized scientific skills. He could see no sense in several refineries competing for the same limited local market; it was not economic. His refined sugar remained cheap to the public by any standards of comparison, and continuously open to import competition. To Knox this was the complete answer to all criticism.

"What the Company most wants is to be left alone, so long as its actions are in conformity with the law," he told the 1912 Royal Commission, which had been set up primarily to uncover the suspected villainies of the "giant C.S.R. octopus". The Commissioners rejected proposals for reviving competition in refining because they considered it would reduce efficiency. "We do not hesitate to express our admiration of the economic efficiency which characterizes every branch of its business which has come under our notice" they reported of C.S.R., although Knox's attitude towards the Commission was not calculated to elicit testimonials. One Commissioner (the only one experienced in the industry, a grower and director of a co-operative mill), in a lengthy separate report which dealt with many other matters, commended the company in these terms:

> It occupies a commanding position in the industry, secured by steadily pursuing for a long course of years a policy which has won for it the confidence and good will of practically the whole of those with whom it has had business dealings. There is nothing to indicate that any of the Company's transactions have been in the slightest degree of a predatory character . . . that the Company earns large profits, both within and without the Commonwealth,

> appears to be entirely due to its volume of business, the command of adequate capital, the complete utilization of by-products, thorough organization, able administration, and high efficiency in every department.

Perhaps it was such reports, or possibly the sense of responsibility which often comes with experience and high office, which tended to modify the views which William Morris Hughes had expressed in the years before the Commission. Perhaps E. W. Knox also came to modify his own stubborn views regarding his completely independent but responsible position. The march of political events and the war of 1914-18 brought the two fiery personalities together in a common cause. One day in 1915 W. M. Hughes, Prime Minister of Australia, and E. W. Knox, General Manager of the Colonial Sugar Refining Company, met together and between them drafted the principles of an agreement by which C.S.R. undertook to refine domestic requirements on behalf of the Commonwealth. This agreement was destined to form the foundation of one of the important institutions of the Australian sugar industry.

In their report the Commissioners of 1912 remarked:

> While the wide divergences of opinion [about public policy towards the sugar industry] are often the result of mere ignorance of essential data, they are still more frequently the result of failure to outgrow ideas, opinions, or policies which belong to the limited outlook of pre-Federal times.

Many factors operated to distort public opinion. Much of the popular lore regarding the Australian sugar industry had its origins in the colourful pioneering days in Queensland. The tropical north appeared a wild and lawless frontier to the comfortable citizens of Sydney and Melbourne. Queensland was imagined to be another West Indies, with Kanakas instead of Negroes, and rich "sugar barons"—a term imported from the West Indian slave days and never applicable in Australia. Most of the planters of those early days were pioneer farmers employing a few Kanakas in their fields and themselves working their own crude mills. But they were often portrayed as rich and powerful, sitting on their verandahs sipping cool minted drinks while their slaves toiled in the cane fields under the cruel tropical sun.

Despite the importance of this early period as the origin of the industry and its interest as the source of colourful myth, it was of little significance in its effects on the subsequent character of the industry. The pioneering phase lasted a brief twenty years, from 1863 to 1883,

and most of the small farmer-planters were ruined by the sugar slumps of the following years. Those early planters were not soft men. It took courage and enterprise to leave the settled areas, move to some wild and lonely tropical valley and there clear the jungle and cultivate crops. Their task required labour but they were not followed into their uncomfortable new places by their fellow-countrymen seeking employment. Being men of their times, they solved their problem by the methods of their times. They followed the example of others and used Pacific Islanders. Their agriculture and their technology were inefficient by the standards of later periods, but they opened up the north-east coast of the Australian continent, winning only meagre rewards, little recognition, and some calumny. Poor markets and lack of capital forced most of them from the industry over seventy years ago but some of the antipathy aroused by their use of coloured labour has lasted long in the southern states.

The slump of the eighties provided a stimulus for the adoption of new attitudes and techniques. Reforms took place in every part of the industry—in cane agriculture, in farming methods, in land use and ownership, in milling technology, in mill size and ownership, in labour relations, and in the relations between growers and millers. As the old-time planters were replaced, the Queensland industry was rebuilt on new foundations of social stability and technical efficiency.

The influence and example of C.S.R. in bringing about these changes was considerable and in several important directions decisive. From the time it moved to Queensland in the early 1880s it was by far the biggest miller and largest owner of cane lands; in terms of production it dominated the industry. It had gained experience and recognition on the Clarence River and brought to Queensland, besides large mills and advanced milling and agricultural techniques, a number of customs and forms of agreement which in New South Wales had proved satisfactory in regulating the relations between farmers and the mills to which they sold their cane.

As C.S.R. grew in importance as the main refiner in Australia it also became the main buyer for the product of the Queensland mills. The price it paid for raw sugar was determined by the state of the world's raw sugar markets and was designed to hold the price of Australian refined sugar slightly below that of the imported product. But the company's position as a guaranteed buyer gave the industry an assured outlet for its product and introduced an important element of stability. It was an effective form of organized marketing. At the turn of the century total Australian production of raw sugar was 112,000 tons of which 40 per cent was made at C.S.R. mills in Queens-

land and New South Wales. This contrasts with 86,000 tons made in 1954 at one C.S.R. mill in Queensland and a total Australian production in that year of 1,300,000 tons.

One of the earliest steps taken by the first Australian Government after Federation was to introduce legislation to accelerate the conversion of the industry to an entirely white labour basis. An excise duty of £3 per ton was levied on all raw sugar produced, with a rebate of £2 per ton for sugar produced exclusively with white labour. Excise and rebate legislation was continued until 1913, by which time the few remaining Kanakas in Queensland had been repatriated to their island homes. From the excise the Federal treasury had a net benefit, after rebates, amounting to £2,692,329, and the industry was burdened with yet another myth. As the majority report of the 1931 Sugar Inquiry Committee stated, ". . . this rebate was termed a 'bounty' (*vide Sugar Bounty Act, 1902*) but the word 'bounty' was plainly a misnomer, which has resulted in an extraordinary amount of misunderstanding of the true position ever since." The excise and rebate legislation did, however, have the effect of hastening the complete establishment of the industry on a white labour basis. Australia became the first country in the world where cane sugar was produced entirely by white men.

When, as a wartime measure, the overall control of the industry passed to the Commonwealth and Queensland Governments in 1915, the Queensland act setting out the basis of payment to farmers for their cane embodied, under the title C.C.S. (Commercial Cane Sugar), the P.O.C.S. formula evolved by Kottmann to determine the sugar content of cane. A considerable amount of other legislation also came into being to give effect to the new form of state supervision of the industry. Several statutory bodies were set up within the industry and the rationalized and legalistic machinery under which the industry now functions is complex and intricate. It works on the whole with smoothness and efficiency because of a number of effective internal incentives and because the legislative enactments relating to the industry have substantially given *de jure* recognition to a number of sound *de facto* institutions, customs and practices evolved by the industry itself.

The very complexity of the system of control and administration of the sugar industry has added yet another difficulty to the problem of communication between the industry and the Australian public. Such a combination of large-scale private industry, co-operative ownership, small farm agriculture and government participation is a rare and unfamiliar phenomenon. The difficulty of obtaining wide

understanding of its nature and efficiency is complicated by its geographical and political remoteness from the bulk of the Australian community. Unlike, for instance, the Australian fine wool industry which is spread widely throughout Australia, the cane-growing communities are confined to a narrow coastal belt in the north-east of the continent. The wool industry is familiar to most Australians, it is easy to understand and its tremendous importance has helped to bring understanding. It is only in comparatively recent times that the sugar industry has approached any similar degree of recognition. The war against Japan helped to emphasize the strategic importance of the ports, communications and settlements which the industry had been responsible for creating.

While the public has only in recent years appreciated the role of the industry, its importance was stressed as long ago as 1912 by the Royal Commission of that year:

> The problem of the Sugar Industry today is not, save in subordinate respects, a problem of industry, of wealth, or of production; it is primarily and essentially a problem of settlement and defence. No nation can afford to regard lightly the development of its industries, the progress of its wealth, or the economic efficiency of its productive machinery. But, important as these things undoubtedly are, they rank, as regards the Sugar Industry, on an inferior plane. The Commonwealth today is brought face to face with one of the gravest problems which has ever taxed the ingenuity of statesmanship—that of the settlement of tropical and semi-tropical areas by a white population living under standard conditions of life. And intimately associated with this problem is the question of national defence. If the ideal of a White Australia is to become an enduring actuality, some means must be discovered of establishing industries within the tropical regions. So long as these regions are unoccupied, they are an invitation to invasion, as well as a source of strategic weakness. Granted so much, it follows that the supreme justification for the protection of the Sugar Industry is the part that the industry has contributed, and will, as we hope, continue to contribute to the problems of the settlement and defence of the northern portion of the Australian continent. The recognition of the nature of this supreme justification is the first condition of a sound public policy in relation to the Sugar Industry. Relatively to it, all other issues are of minor importance.

* * *

One hundred years ago the Colonial Sugar Refining Company commenced as a partnership of a few merchants. For sixty of those hundred years its history, which we have briefly traced, is largely the story of two men—Edward and E. W. Knox. Both were able, determined individualists and their times allowed full scope for their abilities. As Professor H. J. Habakkuk has recently remarked, "Conditions before the first World War favoured the rise to control of men of exceptionally great ambition, thrust and initiative . . . less confined by the pressures of public opinion or the regulations of government than either before or since . . . such men were the pace-makers of economic progress in the nineteenth century."

EDITOR'S NOTE

This historical sketch ends about the time of the first world war. There are some gaps between that period and the remainder of the book which deals mainly with developments of the last decade or so and with the company as it is today. This treatment was adopted partly because time and space were limited and partly because of the desirability in this book of placing on record, for the first time, an account of major trends in the company's early history which still influence the present in a marked fashion. It would have been easy to enlarge the historical chapter to book length and I had to persuade its authors to limit its scope or this might have happened.

This chapter has emphasized the role of the two Knoxes and rightly so, for, as Charles Wilson has commented in his history of Unilever, "the principal reasons why some firms survive, prosper and expand while others dwindle, perish or sell out must be sought in the personalities of the men who manage them. . . In the history of business, as in other kinds of history, biography is a powerful element."

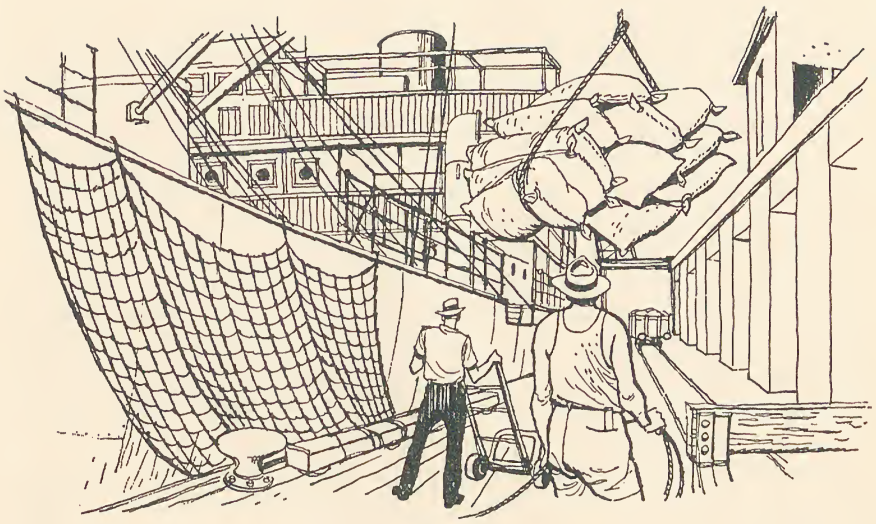
It has not been possible to mention individually many of those who worked with E. W. Knox to build the company from the eighties onwards. There were the men to whom Knox gave the title General Inspectors and who administered the main divisions of the company—refining in Australia and New Zealand, milling in Australia and milling in Fiji. There were the senior refinery and mill managers and engineers who were responsible for the construction and management of new factories of a size and complexity new to the South Pacific. In addition to the chemists whose contribution has been mentioned in some detail, there were the administrators and business men whose authority rested on wider commercial and social grounds and who, in the nature of things, held a status superior to the technologists.

Although the final decisions in important matters were made by E. W. Knox, he did not surround himself with "yes men". He chose for his assistants men capable of independent thought and judgment. By the time E. W. Knox moved to the board as chairman and managing director in 1920 the circumstances were favourable for the gradual evolution of a system of management which did

not depend unduly on the dominating character and authority of one man and which would be more suited to the growth of the company under increasingly complex business and social conditions.

From an early stage, E. W. Knox depended a good deal on his financial assistant, W. H. Rothe, who had been recruited from the Commercial Banking Company of Sydney and succeeded Knox as general manager in 1920. Although W. H. Rothe took over the title Knox had held for forty years he was subject to Knox's close oversight and he could not, in the circumstances, take over his full authority. When W. H. Rothe was succeeded in turn by H. V. Dixon and P. H. Goldfinch, two men who had also worked closely with Knox, they also were more subject to the board and to the influence of expert advice.

When E. W. Knox retired in 1933, only four months before his death, the company still retained much of the outward appearance of the monolithic structure he had created. But beneath the surface many changes had taken place. The most important of these were concerned with the process of policy-making which became more of a deliberative one to which many contributed. This is described by Dr R. W. Harman in the chapter on "Men and Organization". It is sometimes defined as the group method of management and its development in C.S.R. runs parallel with similar growth in other corporations.



CHAPTER 3

The Structure of Sugar Markets

J. M. DIXON

Much of the later story of postwar expansion in Australia and Fiji, the strict control of farm acreages in Australia, the income and future stability of cane farming and milling, depends on an understanding of the market position. "How a market can be created for produce, or how production can be limited to the capacities of the market": J. S. Mill's phrase could be an apt description of the problem confronting the South Pacific sugar industries which is discussed in this chapter. But it is a complicated situation and it would be misleading to over-simplify it.

The writer has long been directly associated with marketing sugar in internal and export markets and has attended many of the important conferences on sugar in London from 1949 onwards.

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When she buys her four lbs. of sugar or tin of golden syrup at the local grocer's shop, Mrs Taylor in London, Mrs Turner in Vancouver, Mrs Thompson in Melbourne, or Mrs McTavish in Dunedin never pauses to think of Indar Singh, a cane grower of Nandi in Fiji, or of Roy Pearson, of Ingham in northern Queensland. But the well-being of Mr Singh and Mr Pearson and of the owners and employees of C.S.R. depends upon the buying habits of Mesdames Taylor, Turner, Thompson and McTavish. These ladies with their many small purchases symbolize the refiner's market. His finished foodstuff is made from raw sugar which is produced at mills in the cane-growing districts and shipped to refineries at home and abroad.

Refined sugar markets are predominantly internal rather than export markets. Refined sugar is discouraged in international trade because many countries wish to have their own refineries and have implemented this policy by imposing higher import duties on refined than on raw sugar; and there are many other reasons why refineries are mainly located near centres of consumption.

In countries which are not self-sufficient in sugar, the refiners import the raws. To the mills, the refiners constitute the market. The sugar of international commerce is predominantly raw sugar and we refer to this international market as the raw sugar market.

The History of Oversupply

Over-saturation of world raw sugar markets was an unforeseen eventual outcome of one of the great wars when Napoleon, blockaded by the British Fleet, sought at least partial self-sufficiency by encouraging production of sugar from beet. Production of state-subsidized beet sugar got out of control in several countries on the European continent in the second half of the nineteenth century, outstripping its original purpose. These countries then applied a system of bounties on exports to relieve their internal markets from the pressure of oversupply. In consequence they flooded the international markets with bounty-fed beet sugar, to the great distress of cane sugar exporters, including Fiji, Mauritius and the British colonies in the West Indies. Although Australia was not a regular exporter before 1924, the pressure of cheap imported sugar depressed the Australian industry, at times with great severity.

There were about seven unsuccessful international meetings on the problem of sugar markets between the 1860s and 1900. Then came what seems to have been the first international agreement to control sugar marketing, the Brussels Convention of 1903. This did not raise

prices but it helped to stabilize them and there was no major trend up or down until the 1914 war.

In fifty years from the early 1840s beet sugar production under the subsidy system had risen from some 5 per cent of world sugar production to about 60 per cent. After the Brussels Convention cane sugar held its own in this sense and went on to recover some ground from beet. Today cane sugar comprises about two-thirds of total sugar production in the world.

World War I created a scarcity of sugar by causing beet sugar production in Europe to fall drastically. Market prices rose. In 1913 the price of raw sugar c.i.f. London was £10 to £11 per ton; it rose steadily through the war and in 1920 averaged £65 14*s* 0*d*, with a peak over £80 and even a few sales reported at over £100. Cane production, with this stimulus, expanded in many parts of the world. A few years after the war beet production recovered and the price fell; in 1925 it was £12 to £13 per ton, and it fell further to an undreamed-of nadir with the great depression of the thirties. Sugar was much cheaper than for at least 200 years—probably than it had ever been. For a time £1 would have bought enough raw sugar to feed the average Englishman or New Zealander for four years. In 1931 came the Chadbourne Plan, the next attempt at international collaboration to rescue the market from its cruel paralysis, which was causing near-starvation in countries like Java, selling practically all their sugar on the world market.

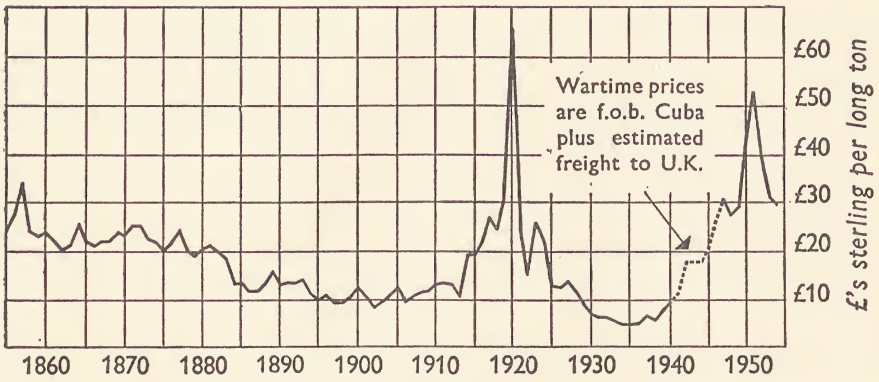
In Fiji throughout the thirties times were hard and living standards low. They were sustainable due to one factor only, the economic aid given by tariff preferences on Empire sugar entering the United Kingdom and Canada. This enabled Fiji and Australia (by that time an exporter) to sell the whole of their output and get £8 or £9 sterling a ton for sugar freighted to its overseas destination, as against the £5 to £6 sterling obtained by Java and other non-Empire producers who, in addition, still had some of their output unsalable. The Australian industry suffered; but it had the benefit of the higher-priced home consumption market, taking about half the production and yielding the millers and growers three times more per ton than did export sales.

The Chadbourne Plan of 1931 aimed to restrict production and regulate exports in order to raise prices. But the plan was not a success because a number of countries, including the United Kingdom (and consequently the rest of the Empire), did not join in it.

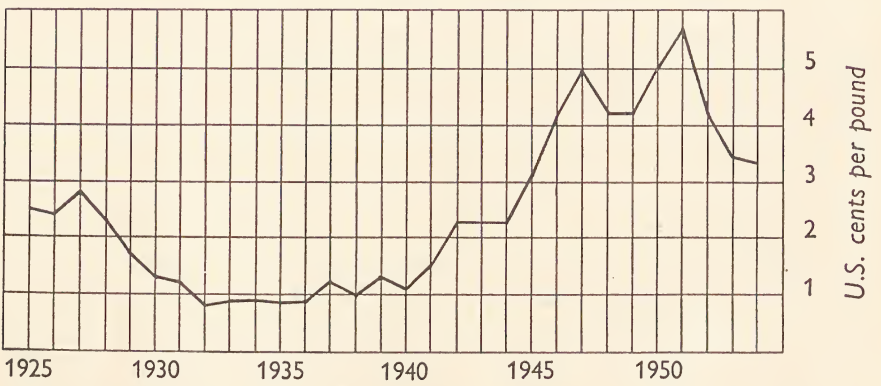
By 1937 there was world-wide acceptance of the gravity of the situation and a conference in London succeeded in effecting the first full International Sugar Agreement. Its principal feature was export

PRICES OF RAW SUGAR—WORLD "FREE" MARKET

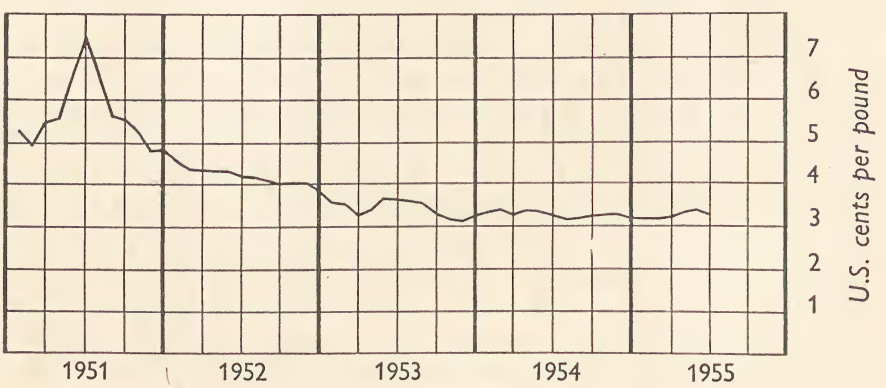
100 YEARS 1855-1954 — **Annual averages c.i.f. U.K.**



30 YEARS 1925-54 — **Annual averages f.o.b. Cuba**



5 YEARS 1951-55 — **Monthly averages f.o.b. Cuba**



quotas, limiting exports to prevent too great a pressure of supply on international markets. The standards of living of millions of people and enormous aggregate sums of capital subscribed by countless shareholders were at stake.

World War II intervened before the International Sugar Agreement had time to show its worth. Once more the market situation was reversed and sugar again became scarce. A few countries like Cuba, not closely touched by the war, expanded production and this was a great help to the Allied cause. Output fell in many countries, including Australia and Fiji, and some other countries were cut off by operational necessity or by enemy action. Sugar was rationed in Australia, New Zealand, the United Kingdom, the United States, Canada and other countries.

Australia, Fiji and the other Empire exporting countries, which had previously had the benefit of Empire preference, accepted from the United Kingdom for a number of years a lower price than the ruling international price. Even New Zealand, although she had always refused to grant tariff preference, was allowed to obtain her supplies from Fiji and Australia at this same low price. Consumers in Australia for a period of years obtained their sugar from the Australian industry much cheaper than the ruling international price.

From long experience and knowledge of sugar markets the company was sure that overproduction and depressed international markets would arrive again. For the history of sugar for 150 years has shown that only in wartime and in postwar booms have unprotected and unassisted sugar producers known real prosperity, and then it has been short-lived and unhealthily overdone. At every possible opportunity the company urged the Australian and Queensland Governments, the Colonial Office and other authorities in London to work towards a new International Sugar Agreement. The Sugar Board and other organizations in the Australian sugar industry took similar action.

British Commonwealth Sugar Agreement

Meantime another development was under way. The British Government, anxious to obtain sterling sugar to ease the drain of dollars for Cuban sugar, anxious to lift rationing, and already committed to buy all the export raw sugar from the Empire up to 1952, accepted the concept of an agreement of still longer term. This was first discussed at conferences in London in 1949, when agreement was reached on some major principles. Negotiations continued over three years and in December 1951 the British Commonwealth Sugar Agreement

(B.C.S.A.) was signed. It is a governmental contract on the United Kingdom side and in the case of Australia.

Because this book is primarily about the company and what it does, it is appropriate to mention that throughout these long, difficult and ultimately successful negotiations Fiji was represented by the company's resident General Representative in London and an officer from its head office was prominent in the Australian delegations. C.S.R. fully realized how vital it would soon become to all growers, employees and shareholders in the South Pacific sugar industries to have markets enlarged in physical size and reasonably remunerative in price.

The stated objective in B.C.S.A. is "to have a long-term agreement for supplying sugar to the United Kingdom, for developing the production of sugar in the Commonwealth countries, and for the orderly marketing of that sugar". The period of the agreement is eight years. Priority is given to sales to Canada, a traditional and valuable outlet granting a tariff preference under longstanding reciprocal trade agreements. The main exporting territories are the British West Indies, Australia, Mauritius, South Africa and Fiji.

The agreement provided for expansion, to carefully judged maxima, of exports from British Commonwealth raw sugar producing countries; for working towards an International Agreement to stabilize the "world price"; and for high proportions of the sugar to be sold each year at a "negotiated price", which was to be entirely divorced from the "world price" of the free international market and "reasonably remunerative to efficient producers", a concept judged in practice by reference to cost of production over British Commonwealth exporters as a whole.

The influence of B.C.S.A. on production for export is illustrated by the following figures:

	Quota under B.C.S.A.	*TOTAL EXPORTS (in thousands of tons)*				
		1948-49 Sept.-Aug.	*1949-50 Sept.-Aug.*	*1950-51 Sept.-Aug.*	*1953 Jan.-Dec.*	*1954 Jan.-Dec.*
Australia	600	485	384	408	740	641
Fiji	170	124	122	70	175	141
British West Indies	900	685	759	720	872	936
Mauritius	470	387	414	451	474	476
South Africa	200	43	60	62	68	180
British Honduras	25	..	..	..	..	1
East Africa	10	6	2	1	..	..
	2,375	1,730	1,741	1,712	2,329	2,375

There is an arrangement between B.C.S.A. exporters for redistribution of shortfalls in any year, so that when one exporter has a bad season the others can export more, provided that the total of 2,375,000 tons is not exceeded.

The overall quota or limit of exports for Australia is 600,000 tons, of which 314,000 tons is at the "negotiated price"; the other 286,000 tons sells at the "world price", plus the value of the preference in the United Kingdom and Canada. Fiji's overall quota is 170,000 tons with 125,000 tons at the "negotiated price" and the remainder, about one quarter of her normal production, at the "world price" with benefit of preference. As approximately half of Australia's raw sugar is required for internal consumption, about one quarter of total production is exported at the "negotiated price" and the remaining quarter is exported at the "world price".

The great advantages of this agreement to the exporters were the expansion of exports it enabled, the long-term security, and the considerable degree of price stabilization obtained by the unshackling of a high proportion of exports from the tricky and glut-susceptible "world price" and its sale at "reasonably remunerative" prices. All this adds up to a reasonable degree of confidence which stimulates adequate investment in the fixed assets and plant which are the *sine qua non* of efficient production. The price provisions have already proved their value. When the agreement was negotiated the "world price" was considerably higher than the "negotiated price", but exporters were not to be tempted by that. On the buying side, the British made no unfair attempt to take advantage of that situation; they knew the "world price" for what it is most of the time—an unfair overall price. It is now about 30 per cent below the "reasonably remunerative" negotiated price.

It is not much wonder that on the export side (and Fiji is almost entirely an export industry) the Empire sugar industries have called B.C.S.A. their "charter of existence". Its term has now been extended until 1962. There are yearly conferences in London to negotiate prices and other matters and C.S.R. representatives attend in the interests of Fiji and Australia.

To the United Kingdom the advantages lay in the assured supply of most of her sugar import requirements from sterling sources, thus reducing the drain on dollar funds, and in steadier purchasing power from the Commonwealth countries for British machinery, fertilizers, trucks and tractors. With this agreement Britain finally discarded, in respect of sugar, her long-held policy of maintaining the cheapest possible breakfast table without regard to the standard of living of

the people who produce the food—and this Britain doubtless takes into the reckoning as a major item on the credit side of the agreement. The sugar she gets is not expensive by reasonable standards.

There was some dissension in the early B.C.S.A. discussions, for the problems were complex and difficult and the buyers as well as the producing countries had special problems. But the exporters came under broad-minded leadership and decided to make the agreement multilateral on the selling side; they learned to work together to mould the agreement into a cohesive and integrated piece of marketing machinery. It can have few, if any, counterparts in the history of inter-country commodity buying and selling. The British ministers and senior Whitehall officials, while they were experienced and hard-headed bargainers and never forgot that basically they were buying for British consumers, negotiated as prudent yet venturesome, cautious yet constructive men. There was a general awareness that an agreement with all the features and complexities of this one was a new thing, and that the consequences for good or ill would be vast, vital and long-felt for many people in many countries scattered through the world. There is little doubt that history was made and the agreement is likely to gain in stature as an example of economic statesmanship in the British Commonwealth.

International Sugar Agreement

It will be noticed that Australia, under B.C.S.A., had about half her normal exports (one-quarter of production) as "free" sugar to be sold on the basis of the free market or so-called "world price". Fiji has 45,000 tons or also about one-quarter in that category. This was a comparative weakness in the situation, not protected by B.C.S.A., for these are important segments of total production. In addition to retaining tariff preferences on that sugar when sold to the United Kingdom and Canada, something has also been done, by a new International Sugar Agreement (I.S.A.), to stabilize the price ruling on the world market.

The new I.S.A. was finally negotiated and signed in London in October 1953 by most of the important sugar exporting countries and many of the importing nations of the world. The first of the stated objectives is "to assure supplies of sugar to importing countries and markets for sugar to exporting countries at equitable and stable prices". This objective is to be achieved by export quotas which can be adjusted: downwards, if the price goes through the "floor" of $U.S.3.25 per 100 lbs. (alongside ship at Cuban port); upwards, if

it goes through the "ceiling" of $u.s.4.35. The British Commonwealth exporters have an "irreducible" combined export quota which ensures to them the total export rights under B.C.S.A. For 1956 the Commonwealth exporters receive (and have shared out) an increase of 75,000 tons bringing their total quota under I.S.A. to 2,450,000 tons. I.S.A. has not prevented the "world price" deteriorating to a low and unsatisfactory figure for most producers—even going down through the floor—but it has stopped it from falling to absurd levels.

In the sphere of world sugar markets, which has been for nearly a hundred years a sphere of politics first and economics second, not too much should be expected from the new I.S.A. It did what was practicable—rather than what might be theoretically desirable—to stabilize prices and exports somewhere near the *status quo*, in the face of great capacity for overproduction and very high stocks in several countries, including the United Kingdom and Cuba.

This International Agreement is an inter-governmental commitment signed, *inter alia*, by the Australian Government and by the Government of the United Kingdom on behalf of British colonies, including Fiji. Officers of the company again represented Fiji in the United Kingdom delegation and were also among the representatives of Australia. The Australian delegation had official Commonwealth Government status, Queensland State Government participation, Ministerial leadership, and representation from other sections of the Australian industry.

The Three-Storeyed Shop

The sugar markets of the world can be thought of as a shop with three floors, the bargain basement, the ground floor and the top floor.

On the ground floor is the refined sugar sold by refineries, mostly in domestic or home consumption markets. The other two floors are mainly for international transactions, and most of the sugar is raw sugar.

The top floor carries that part of the international trade in raw sugar where the market is safeguarded, in varying degrees, by special arrangements or tariff preferences. On this floor are found nearly all British Commonwealth sugar exports under the "negotiated price" arrangements and British and Canadian tariff preferences. Philippine and Cuban exports to the United States are here, too, because of quota and preference arrangements.

The bargain basement is the floor where "leftovers" from the other two floors are sold internationally without direct, but with plenty of

indirect, price aids. As with any bargain basement, the prices here are sustainable by the seller because of the normal higher margins obtained in the other parts of the shop. A bargain basement is not the place on which one can continuously depend for all supplies; there will be times when there is little offering there. On the other hand, only about 10 per cent of the total world production is sold in the basement and prices are depressed, and often distressed, by oversupply. A few countries, of which San Domingo is one, have to rely solely on the basement but most have access to the other floors for sale of part of their production.

Cuba, after selling about half her sugar to the United States on the top floor, has a quota under I.S.A. for a similar amount (actually 2,214,000 tons) for sale in the bargain basement; there are many other countries, too, with quotas to sell here, next in size to Cuba being Formosa and San Domingo, each with 590,000 tons. The price in the basement has often been a "dump" price, starting with last century's subsidized beet sugar exports from Europe. Unfortunately, because this price is called the "world price", it is often wrongly thought of as a fair standard of sugar values and of efficient production.

The price obtained for some of the top floor sugar—for exports benefiting from United Kingdom and Canadian tariff preferences—is the bargain basement price plus the value of the preference—£3 15*s* 0*d* sterling per ton in the case of the United Kingdom. Therefore, although the preferential markets are on the top floor, the price level ruling in the bargain basement is important to Australia and Fiji, affecting about one-quarter of their production in years when the full quotas are produced.

Unusual outlets on the markets of the world are sought for Australian and Fijian sugar but, though some such sales are made, they cannot be relied upon. Through tariff preferences, or proximity, or B.C.S.A. (to which New Zealand has become a quasi-party on the buying side), the export sales for South Pacific sugar production are mainly through the top floor to the United Kingdom, Canada and New Zealand. For the Australian industry the most important market of all is on the ground floor, the domestic market of Australia.

The Internal Markets

The Australian internal market has generally provided a satisfactory price for nearly half the total output of Australian millers. Last year the quantity was 528,000 tons. (In addition there is a small trade in refined sugar to nearby islands outside the overseas agreements.) The

internal market is preserved for the Australian industry by an Act of the Federal Parliament carrying out the longstanding national policy of supporting the sugar industry. The method, in operation since World War I, is a prohibition on imports of sugar in return for which the raw sugar industry must accept what is judged to be an equitable price. As considerable attention is given to this in other parts of this book, it is sufficient here to mention these bare essentials in order to complete the outline of the market structure which supports the economic life of the Australian industry.

In Fiji the internal market is small, amounting to some 13,000 tons a year, about 7 per cent of target production. The Fijian industry is utterly dependent on export markets.

The market situation obviously enforces the control of production. Though there may be seasonal variations, the annual targets for raw sugar production can be summarized for the next few years, after allowing for population increase in Australia, as follows, in tons *tel quel:*

	Australia	*Fiji*
For local consumption and nearby islands	*550,000*	*13,000*
For export under B.C.S.A. and I.S.A.	*600,000*	*170,000*
	1,150,000	*183,000*

Relation of Various Market Prices

Summing up the relation of the various markets and their importance to the income of millers and growers, the situation in Australia in a normal season (when target production is reached), based on most recent prices, is as follows: the raws allotted for Australian refineries, and to be consumed in Australia as refined sugar, represent nearly half the total production and would return about £46 per ton (94 *net titre*) of raws delivered at mill port; the quarter of production exported at the "negotiated price" would yield about £45 per ton; the remaining quarter, exported at the "world price" plus preference, would return about £31 per ton, or some 30 per cent less than the "negotiated price" exports. The average price for the 1954 season was £41 4*s* 9*d* per ton, the free market component being larger than normal.

Fijian production (omitting the small quantity consumed in Fiji) is made up of about three-quarters at the "negotiated price" and one-quarter at the "world price" plus preference; the currency is different

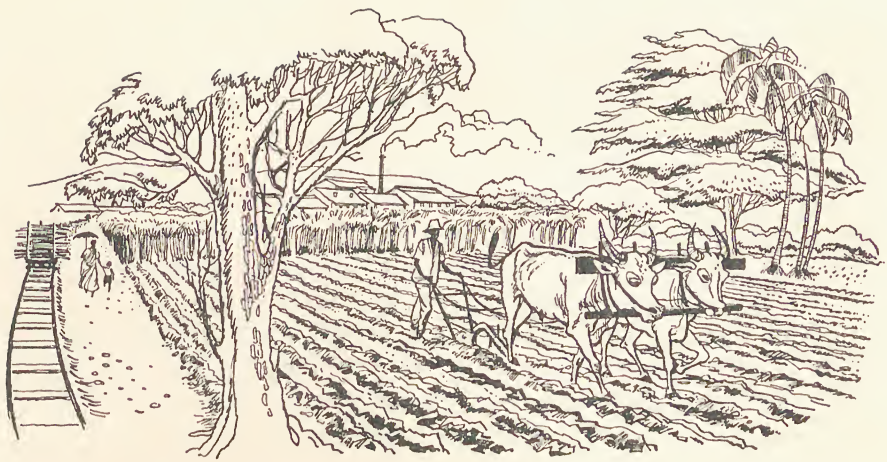
in Fiji but these prices have a relation to each other similar to that obtaining in Australia.

Factors Determining the Welfare of Sugar Industries

What has gone to make the fortunes and misfortunes of the sugar industries in the South Pacific?

The Napoleonic wars of 150 years ago and the British Fleet under Nelson and other admirals; the slavery of Africans and its abolition; the continued desire of nations to be at least partly self-sufficient in sugar or to have assured sources of supply in time of war; duties, taxes and tariff preferences; "dumping" and subsidized exports; the vital need to populate tropical Australia; the indenturing of labourers from the Punjab, Madras, Bengal and other parts of the Indian subcontinent; the pressures generated by the need to provide a living for many millions in tropical cane-producing countries; decades of international conferences; sunlight on a green leaf; rain, flood and drought; cane pests and diseases; the efficiency of agriculturists, of cane and beet breeders, of sugar factory technologists; the foresight and decisiveness of capitalists and modern administrators; capital from tens of thousands of shareholders for bigger and better machines and factories; human effort: all this fascinating blend of science, natural causes, politics, sociology, economics and business management. But this is looking backwards. In looking forward the factor which looms largest is the buying habits of the aforesaid Mesdames Taylor, Turner, Thompson and McTavish.

In the South Pacific sugar industries, in common with the rest of the sugar world, practically all that is possible by international and other marketing arrangements has been done to expand production and to ensure "equitable and stable prices" to consumers and producers. But how can producing areas develop further and sustain increasing populations? Price for raw sugar is one thing, but what of quantity and volume of production? The future for producers lies very much with the four housewives and their youngsters growing up. If their habits in eating sugar and sugar-containing foods should change, so will the fortunes of producers because, since sugar markets are now tightly organized, the level of production is controlled by the number of consumers and the amount of sugar consumed per head. Compared with other household foods sugar is one of the cheapest, and the best way to encourage people to keep consuming sugar, or to consume more sugar, is to keep it cheap. This policy underlies the methods and organization discussed in chapters which follow.



CHAPTER 4

The Sugar Industry of Fiji

A. G. LOWNDES

The Colonial Sugar Refining Company together with the growers who supply cane to its mills constitute virtually the whole of the sugar industry in Fiji. There is no refining industry and almost the entire production is exported. There is little government supervision or participation, except through the inevitable taxes. Thus the industry here is relatively simple to understand and it is possible to get an uncomplicated picture of a major activity of the company and of a raw sugar-producing industry. This may help, too, in understanding the more complex Australian situation described later.

I was commissioned by the company to write a description of the industry in Fiji, partly because most of my background and interests lie in land utilization and the economics of agriculture. I realize that the picture painted is eulogistic of the company and the farmers, but I make no apology for that; I have tried to give an impartial description without adornment.

March 1955

THE Fiji Islands are a beautiful and prosperous British Crown Colony in the South Pacific Ocean some 1,800 miles from Sydney. They comprise two main islands, Viti Levu and Vanua Levu, and over three hundred smaller islands, with all the charm of the tropics in beautiful mountains, villages set among coconut palms, and coral reefs and lagoons. The proud and lovable Fijian people, who ceded their land to the British Crown only eighty-one years ago, today number 140,000. They are now outnumbered by a large Indian population of 160,000, largely descended from indentured labourers introduced between 1880 and 1916. These Indians are the main farmers and workers in the sugar industry.

The sugar industry provides the principal economic strength of the colony, with copra and gold next in that order. Exports of sugar and molasses in the three years 1951-1953 averaged £5,351,419 f.o.b. Fijian port, considerably more than the value of all other exports combined.

The Colonial Sugar Refining Company not only operates the five sugar mills, transports all cane to the mills, markets the whole output of sugar, and ships the exportable sugar, but also plays an intimate part in the growing and harvesting of cane by individual farmers. Its achievement is quite unique for an Australian organization, for no other has played such a major role in colonial development. The company has grown with the sugar industry in Fiji since 1880; it has guided and shaped the pattern of land settlement and farming methods; it has survived the difficult times when all other mills failed; and has steadily built up assets in Fiji with a replacement value, if installed new at today's costs, of about £15,000,000.

Fiji is fortunate in having achieved "peaceful co-existence" between her diverse races—native inhabitants, Indians and Europeans. Colonial administration has been wise and far-sighted, and the company has made an important contribution to the gradual evolution of a happy social balance between people of many races and religions.

Progress has been made in the difficult matter of sharing the proceeds of the sugar industry by negotiation between farmers, employees and the company, although there has been strife, especially in the long years when sugar prices allowed none to make a reasonable return. The company was, perhaps, slow in changing its dominating attitude towards the Indians as they developed from indentured labourers to relatively prosperous farmers and mill workers. At the same time, the Indians and their leaders had a good deal to learn in acquiring experience and responsibility in the working of their associations and trade unions. Today the relations are good. Any Australian must be

impressed with the good working basis which has been evolved for solving industrial problems by collective bargaining between the company and the Sugar Workers' Union. This has worked so well that neither side avails itself of arbitration. These are achievements of which a company and a people may well be proud.

The Environment

The two main islands are the only ones with suitable areas for growing sugar cane on a sufficient scale to supply a modern mill. These two islands have pronounced "dry" and "wet" sides. On the "wet" or south-east coasts the average rainfall exceeds 140 inches; in one cane-growing district on the Rewa River 262 inches were recorded in 1949, with 271 wet days. Heavy rainfall of this order presents drainage and cultivation problems to the farmer and is not conducive to the ripening of the cane. As a result only one mill, at Nausori near Suva, has survived on the "wet" coasts. The others are all located on the "dry" northwest coasts, which have average rainfalls of 70 to 85 inches.

There is a pronounced wet season, between November and April, when hurricanes and cyclonic storms occasionally occur, and the remaining months are relatively dry. Combined with favourable temperatures, these climatic conditions are reasonably well suited to cane-growing, although a high level of farming skill is required to cope with the occasional very dry or very wet years.

Both islands are mountainous with very restricted areas sufficiently level for agriculture. Probably less than one-third of the total areas under sugar cane would be described as first-class soils, and these better areas occur mainly in half a dozen widely separated river valleys. The remainder of the cane lands are on undulating to hilly areas, strung out along the foothills and small valleys within a few miles of the ocean.

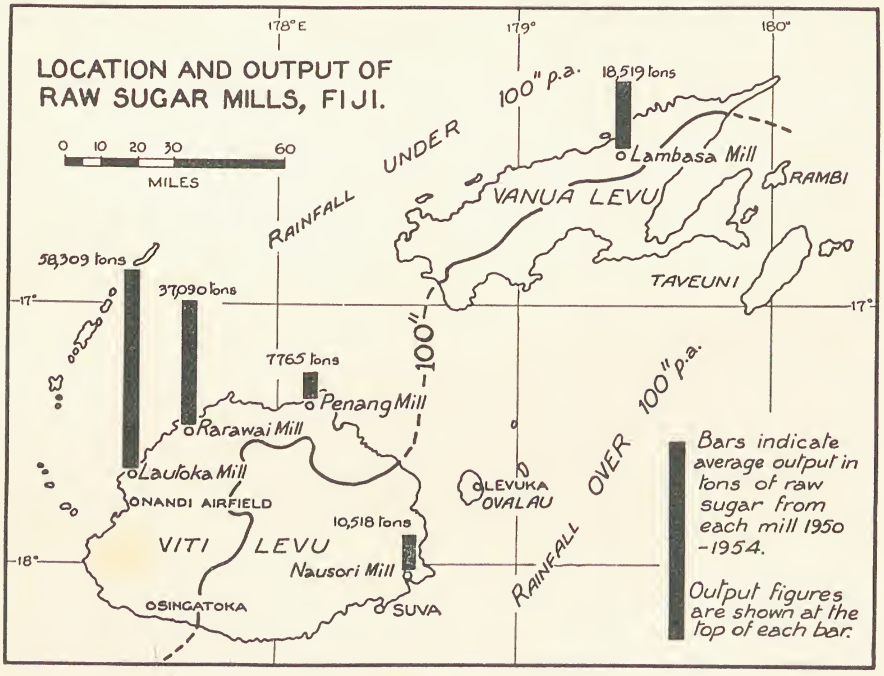
One result is an unusually high capital and maintenance cost in railways, locomotives and rolling stock, all of which are provided by the company. It has constructed over 400 miles of permanent railways, mainly along a hilly coast fringed with mangrove swamps or ending abruptly in the ocean, and this alone was a considerable engineering achievement.

On the dry sides of the islands, where over 90 per cent of the cane land occurs, there was one advantage in that there was very little forest to clear; new areas could be brought under cultivation mainly by ploughing in the native grasses. Nevertheless, some of the cultivated

area would be regarded in many countries as too poor for the commercial production of sugar cane. The area cultivated for cane has been increased by nearly 20 per cent in the last 5 years. This extension has been achieved mainly by small farmers on hilly marginal lands. The potential appears relatively small for further extension of cane-growing areas which would be readily accessible to existing rail transport and mills but, if markets become available, production could be increased by an extension of the lorry delivery of cane to main lines. There are good prospects, too, of increasing yields per acre.

The Farmers and the Land

When planters began to grow cane in Fiji, their first problem was labour supply. The Government of the colony strongly resisted any coercion of the Fijian people and also frowned on the continuation of recruiting other Pacific Islanders for work on plantations. In spite of opposition by many planters, a solution was found by bringing indentured immigrants from India under contract to the Government of Fiji. They had to work where directed for five years, could work for another five years for whom they pleased, and were then entitled to a free passage back to India with their families.



CANE-GROWING AREAS SUPPLYING LAUTOKA AND RARAWAI MILLS—FIJI

The first ship carrying Indians under this system arrived in 1879. The last arrived in 1916, after a total immigration of 62,837 people, of whom only one-third exercised their right to repatriation. From these people have come the great majority of the 160,000 Indians in Fiji today, and Indians cultivate about 92 per cent of the cane lands. These people have largely done away with the caste system, they have freed their women of many of the restrictions of their homeland, they are improved in health and stature, and they have attained a level of economic prosperity which probably exceeds that of any other rural group of Asian people.

The Indian Government had terminated the indenture system in 1916. When all existing indentures expired in 1920, there was a drastic shortage of labour. Many Indians had already acquired their own farms; those who were now released from indenture scattered widely and many refused further work. C.S.R. had been encouraging independent planters and, since 1906, had been leasing plantation areas to ex-officers who wished "to strike out for themselves". Some of them had become very prosperous during the period of high prices immediately after the World War but were faced with a collapse in sugar prices and were now unable to work their estates.

C.S.R. was faced with the same disastrous position on the plantations it was still working, as well as on the leased areas now reverting to it as the European planters relinquished them. Its big investment in mills would be in danger if cane supplies could not be maintained. It had, however, been making efforts for several years to find a method of working its holdings by Indians, under some form of tenancy agreement. It was able to draw on its experience in Australia where, over a period of fifty years, it had subdivided its estates in northern New South Wales and in Queensland into small farms and where many wage-earners had been settled as farmers. The experience gained in Australia was to prove vital to Fiji and the company's overall financial strength allowed it to survive difficult times in the colony.

Two schemes were tried without success before the present "Tenant System" was evolved. Under this system the company's lands were subdivided into farms of eight to fourteen acres, according to the quality of the soil, with an average area of eleven acres. Each comprised sufficient land for a man with his family to farm for sugar, to grow their vegetables and rice and to graze a cow. These farms were leased at low rentals to Indians who were assisted to establish themselves in many ways, by cash advances, loan of implements, the delivery to the farm of imported fertilizers at cost, the supply of seed cane, and technical advice—forms of assistance many of which are

continued today. Although the system was evolved by officers of the company with a wide knowledge and appreciation of field matters, there was some scepticism at high levels about the wisdom of placing so much independence and responsibility on the shoulders of people with limited experience and finance.

But the system has worked and has rightly been described by H. Martin Leake, an English authority on tropical agriculture, as "the boldest experiment in Colonial agriculture during the present century". By 1925 Indian tenants were cultivating 10 per cent of the cane lands compared with the company's 52 per cent; by 1934 Indian tenants cultivated 53 per cent compared with the company's 6 per cent and today the company cultivates less than 3 per cent. Half of the total cane land today is not C.S.R. leasehold or freehold; it is occupied by Indian and Fijian "contractors", or independent farmers, as their own freehold or on leases from the Native Lands Trust Board and other landlords.

The decision on the desirable size of a tenant's farm was based on experience of the area which could be properly worked by an Indian family. It has proved to be eminently sound. At the same time, the company has continued to exercise close control over the transfer of the leases, the way in which the land is used, and the financial position of its tenants. These things have caused some dissension but are now generally agreed to be beneficial to all parties. Early in 1955 the company concluded, after negotiations with the farmers' representatives, a new tenancy agreement which extends the tenure period to 21 years with option of renewal for a further 21 years. This consolidated the situation, which had already existed in practice, that a good farmer has continued security of tenure for himself and his family.

The policies of the company have also had a big influence on the contractors' farms. A pattern of land utilization has been established with at least four major advantages for Fiji and for the industry as a whole.

> First, there is the social and economic stability which comes from the creation of a body of small, independent farmers, secure on their individual farms.
>
> Secondly, individual farm areas are held at a sound and economic size, compared with the fragmentation of holdings which has, over the centuries, impoverished so much of Asia and would otherwise very soon develop with Indian farmers in Fiji.
>
> Thirdly, there is supervision and a considerable degree of insistence on farming practices which will maintain and build soil fertility.

> Finally, there is some control, only partially successful though it must be, over the centuries-old tendency of many Indians to get themselves into a hopeless position with the moneylenders.

This close relation between C.S.R. and the farmers has been accompanied by the growth of many interesting social responsibilities for the company's field officers. They are all obliged to study Indian customs and traditions and to be able to converse with reasonable fluency in Hindustani, which is the *lingua franca* of the Indian community in Fiji. Field officers are frequently asked for advice on domestic and family matters, even for help in making out a "Last Will and Testament" on a form supplied by the company. Many company officers are elected by the Indians as managers of their community schools, largely because of their integrity and their impartiality in solving the problems which arise between families and groups.

All these activities, directly affecting cane production and also concerned with social conditions in the community, may be criticized at first sight as too paternalistic. But the company is essentially, in Fiji, a sugar miller; the miller must have assured and adequate supplies of cane; and these supplies are more likely in circumstances where the farmers realize that their social and economic conditions are steadily improving, with the help of the milling company to enhance their own efforts. Many C.S.R. activities, which at first appear to be well outside the field of a commercial organization, are better interpreted as examples of enlightened self-interest which have benefited all partners in the industry.

Fijians cultivated only 6,298 acres of the 108,727 acres under cane cultivation in 1954. They are not generally attracted by the demanding and constant work of cane farming. Their communal traditions are also opposed to the essence of the one-man farm—the acceptance of the labour and trials of constantly tending a crop in return for the individual's end reward in money. The clan quite frequently expects the sharing of a member's cane proceeds; even the sacrifice of his working bullock has sometimes been required for a feast given to visitors.

From the days of the first British Governor the policy has been to assist the Fijian to meet the problems of adaptation to a money economy. The company has played its part, although the return for effort expended must have been most disappointing. It conducts a training farm at Drasa, one of its main estates, solely for training Fijian youths in cane farming. There is a three year course with 80 trainees under the direction and instruction of a field officer and a Fijian supervisor

who is a "Ratu", or chief. The trainees are provided with clothing and pocket money, and deferred pay is accumulated to help them make a start on their own farms. Through Drasa have passed 358 Fijian trainees and 71 of them are now on C.S.R. farms as tenants. The company maintains close liaison with the Government's District Commissioners in selecting trainees and assisting them later.

Experiments are also being made with community cane-growing by Fijians. A few magnificent Fijians, including at least one with the status of Ratu, who was, incidentally, a successful cane farmer and ex-champion heavyweight boxer, are also employed as assistants to field superintendents, with the special task of guiding and helping their own people in cane farming.

Agricultural Methods

The "seed" cane is planted from February to May in drills or deep furrows on carefully cultivated land, so that it is well established before the dry season comes. It is fourteen to eighteen months before it is ready for harvesting as the "plant" crop. After being cut to the ground, a second growth or "ratoon" develops and provides a harvest in a further twelve months, though this ratoon crop yields less than the plant crop. Second and even third ratoon crops will grow but are not normally worth while in Fiji and the roots are usually ploughed out after the first ratoon crop is harvested. Harvesting takes place between June or July and December, a period when the cane is well grown and its sugar content is high after the cooler and drier months.

During the last few years a 33 per cent crop cycle has been generally adopted. The recommended practice is for the farm area to be divided into three parts, with one-third under plant cane, one-third under a ratoon crop, and the rest under short-term fallow sown to a leguminous green manure crop.

This is the general system of farming recommended by C.S.R. and it is striking evidence of the company's influence to see the extent to which the system is adopted by both tenants and contractor farmers. The legume crop is of great importance in the rotation, not only for its value, when ploughed in, to improve soil texture and fertility but also for the protection it gives to the otherwise bare soil during the rainy season.

Before World War II, most of the colony's rice was imported. During the war rice-growing increased, due to difficulties in importing rice and to its high price, and today the colony is practically self-sufficient. The introduction of rice to cane farms has been bad for maintenance

of soil quality and cane production. It replaces the legume crop on at least part of the fallow area. It also delays the planting of seed cane on this area until after the rice harvest in April-May so that there is insufficient time for proper preparation of the soil and for good establishment of the plant cane before the dry months. The rice-growing which supplies their staple food is regarded by many cane farmers, however, as more important than their cane crop or the maintenance of soil fertility and it must now be accepted as part of farming practice. The company limits the area of rice grown by its tenants to one or two acres, ample for the family's needs. Wherever possible, too, areas of marginal land, of lesser value for cane but quite satisfactory for rice, are made available to farmers so that they will retain their more suitable soils entirely for cane cultivation.

The company exercises its guidance of and influence on farmers through its field superintendents and field officers. Their recommendations are based on experience and contact with research in Australia and other countries, on the results of methods tried on the company's own sugar cane estates in Fiji (which have now been reduced to less than 3,000 acres and are used primarily as training grounds for field officers) and on the observation of results obtained by the best Indian farmers themselves.

There are eight field superintendents and sixty-one field officers. Fifty of these field officers control sectors each containing from 150 to 490 farmers and cutting about 25,000 tons of cane per season. They live in their sectors, which may extend for several miles, and have continual contact with the farmers, travelling on horseback or by road, launch or railway. These men have a fascinating range of responsibilities. Through them the company has, theoretically, great powers of direction and control. In practice, their work is done mainly by leadership and persuasion. In the last five years the company has removed only three of its 4,742 tenants from their farms and then it was for flagrant abuse or neglect of their farms.

One of the main C.S.R. contributions to Fiji has been in the vital field of introducing and breeding varieties of cane to suit the various conditions there. Of the cane harvested in Fiji, over 60 per cent is of varieties bred by the company, either in Fiji or in Queensland, and all varieties have been introduced by the company. Following earlier work at various mills it established a plant breeding station at Rarawai in 1904. Another was started at Lautoka in 1950 as part of an accelerated drive to improve varieties in Fiji. The company's experience in Australia, its plant breeders, and its facilities for quarantine and research are assets to the Fijian industry which can hardly be assessed.

The individual farmer is paid for tons of cane delivered, but the overall price is based on the average yield of sugar per ton of cane for the whole mill for the season. Thus, a few farmers benefit if they grow a variety which gives high tonnage but low sugar content but the farmers as a whole suffer because of the lower overall yield of sugar. Moreover, the mill is faced with higher costs of transport and extraction. Here is a situation which is clearly full of problems and imperfections, but nevertheless the practical results are far better than one might expect, due largely to the influence of the field staff and the co-operation of most farmers and their associations.

Cane diseases have been fatal or crippling to sugar industries in some countries and constant vigilance must always be exercised. In Fiji, these essential precautions have been almost entirely the responsibility of C.S.R. Today, control is primarily by the company prohibiting the growing of non-resistant varieties. There is a further check by "roguing" the crops, or digging out and destroying infected plants. The company's field staff organizes and supervises gangs to do this work. The company pays the wages of the workers, later debiting the wages against the farmers' individual accounts in proportion to their areas under cane, while supervision, transport and other items are provided by C.S.R.

The field officers also organize drainage gangs to dig and clean drains affecting several farms. Many problems arise with farmers who do not wish to supply labour and with the individual farmer who does not wish to co-operate or has a private feud with neighbours. All of these human problems are handled by the company.

The use of fertilizers has been encouraged by C.S.R., which organizes and finances nearly all supplies to the farms. Coral sand is used in lieu of lime and is essential on many soils for healthy crops. In 1954, 39,000 tons of coral sand were quarried or dredged with company equipment, distributed over the company's permanent railways and then over portable lines right onto the farms. A total area of 5,474 acres was thus treated at an average rate of slightly more than 7 tons per acre. The cost to the farmer averaged about ten shillings per ton delivered on the farm, an extraordinarily low figure when it is realised that some of the sand is carried up to 50 miles by rail.

The company also buys in bulk and imports all artificial fertilizers used in the cane industry. The quantities used have steadily increased to 5,908 tons of sulphate of ammonia and 2,085 tons of superphosphate in 1955. These are supplied at cost and financed by the company, to be recovered months later from the cane payments. Again the end link in the chain is a field officer travelling on a company locomotive

and collecting signatures and thumb marks in his field book as the bags are delivered to the farmers in his sector.

Most of the cultivation of the crop is done with bullocks or horses drawing ploughs, scarifiers and harrows. In the last three years, however, there has been a striking development with tractors. Each year the number of tractors has almost doubled, until now there are about 400 in use on cane farms. The advent of efficient, low-priced tractors and the better cane prices have combined to produce a minor agricultural revolution which could hardly have been foreseen ten years ago.

Very few farmers have sufficient area to warrant a tractor for their exclusive use, but most tractor-owners are doing ploughing on a contract basis for their neighbours. This allows the small farmer to take advantage of good soil and weather conditions to finish ploughing more thoroughly and far more quickly than with his animal-drawn equipment. At the right time, especially when operations have been delayed by bad weather, the headlights blaze and the tractors work around the clock.

The Harvest

Harvest time in sugar country is "the crush". It is a time for mighty physical effort and calls for the utmost in organization and co-ordination. Today Fiji produces a tonnage of cane greater than the whole wheat crop of New South Wales. Every stalk is harvested by hand and nearly all of it is handled by rail from the field where it is grown to the mill, some of it being hauled as much as 82 miles.

Once the cane is cut it is desirable that it be crushed as quickly as possible and at most within two days. This introduces major traffic problems, especially at a mill fed by a single main railway track from areas more than a hundred miles apart. From this main track and its branches, portable lines have to be laid up the valleys and into the individual fields where cane is being cut, and sometimes these lines have to be laid twice in a cutting season, first for the plant cane and later for the ratoon crop.

Cane cutting is always done by gangs of men for it involves laying portable lines into the fields, cutting anything from 15 to 40 tons per acre, loading the cane on trucks, and getting this done quickly for each farm and locality while the portable line is available.

In Fiji there has developed a unique system of co-operative cutting by gangs composed of the farmers or their substitutes. All the farmers in a locality, in groups varying from thirty to eighty, sign an agreement among themselves that they will serve as cutters or supply substitutes.

In effect they have to supply to the gang, over a season, labour equivalent to what would be required to cut their own cane. Each farmer agrees to forfeit a bond if he fails to contribute his share. The agreements vary in slight details but in many of them the farmer is fined three times the amount by which his contribution of labour falls short of his agreed share. These sums are placed in a pool and paid out to the men who have contributed extra work.

The farmer who works in the cutting gang can usually earn as much in wages as it costs him to have his cane cut but, in practice, there has been a tendency for many years for farmers to employ substitutes in the gang.

The nominal scale of payment for cane cutting has remained virtually unchanged for over twenty years and, instead of increasing the rates, the general practice is for substitutes to demand a "bonus" of £40 to £50 before they will join a gang. This bonus system has the weakness that it is not directly related to the amount of work done by the substitute. In some districts a different basis is now in operation and the substitute is paid at the end of the season a sum equal to three times his earnings on the accepted wages scale.

The gang elects a "sirdar" who acts as foreman and makes up the pay list to be checked by the company's field officer. The company advances fortnightly wages to the gang, debits the farmer whose cane has been cut and deducts this sum from the proceeds of his cane. The order of cutting is decided by the field officer, who also organizes the supply of portable line and cane trucks. Members of the gang lay the portable line and the gang is responsible for getting the loaded trucks of cane to the permanent tramline.

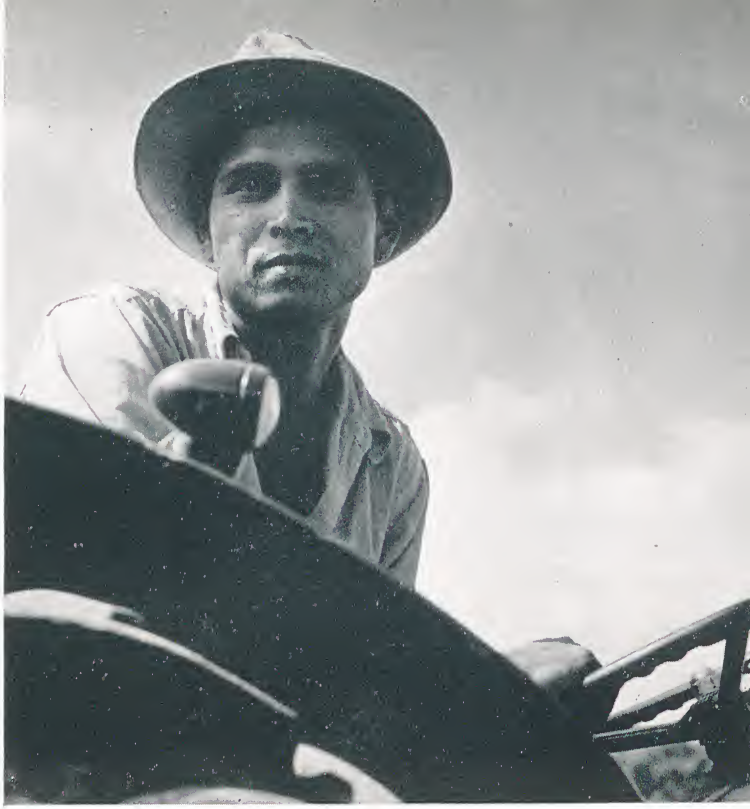
Professor C. Y. Shephard in his report on the sugar industry to the Secretary of State for the Colonies in 1945, wrote:

> Both the company and the farmers are to be congratulated on this highly efficient method of harvesting cane. This orderly system is vastly superior to that with which I am familiar in Trinidad, where each cane farmer cuts and carts his own cane. . . . The co-operative harvesting system, coupled with the fact that most of the cultivation is performed with animal-drawn implements, enables the typical Indian family in Fiji to cultivate 10 or 12 acres in sugar cane. The typical Indian family in Trinidad, where all the cultivation is done by hand and where the carting of cane is chaotic, can cultivate only about 5 acres of cane land.

Not the least interesting and valuable feature of the system is that, although the company's officers supervise and organize many details,

C.S.R. field officer and sirdar (foreman) of cane cutting gang discuss harvesting arrangements at Indian farmer's home.

Indian farmer.



The company's chief manager in Fiji (Mr C. Elliot) and Indian foreman.

Instructing young Fijians. The company maintains a residential training school for Fijian youths where they are taught cane farming and tropical agriculture.

Technical field officer with Indian assistant (*left*) and Fijian assistant (*right*) makes notes on development of experimental cane.

C.S.R. field officer and Indian farmer. There has been a rapid increase in use of tractors.

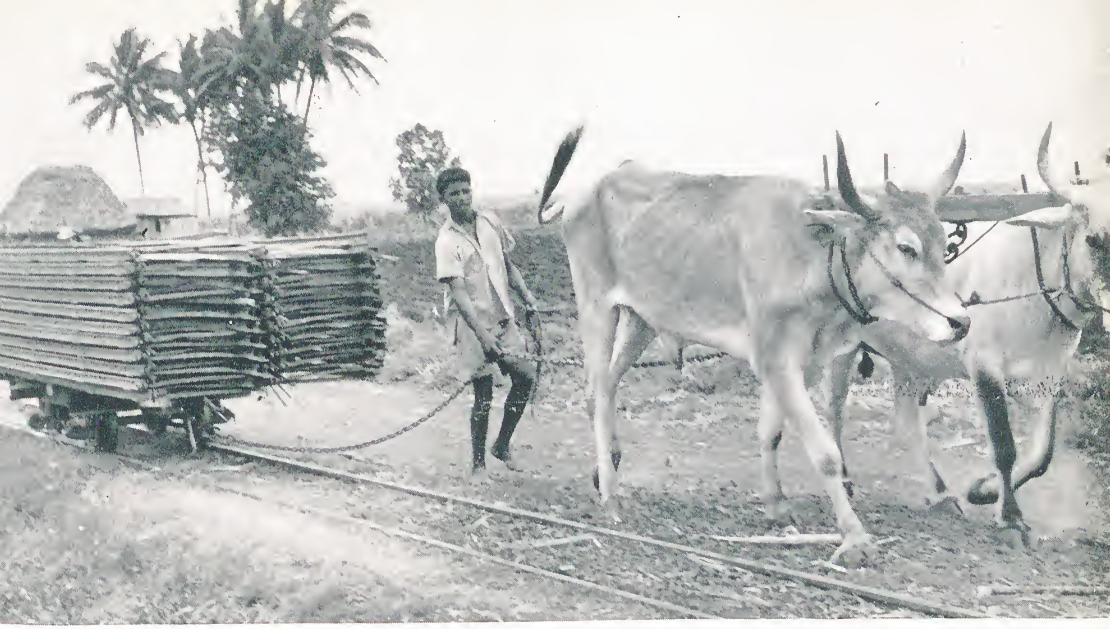
Fijian farmers cultivating and fertilizing young cane.

Cane farms, Fiji. Indian farmers' homes dotted along the roads. Mangrove swamps on the coast in the distance.

Harvesting sugar cane.

Cane-cutting gang.

The gang's water carrier.



Hauling lengths of portable line to the field. *Fiji official photograph.*

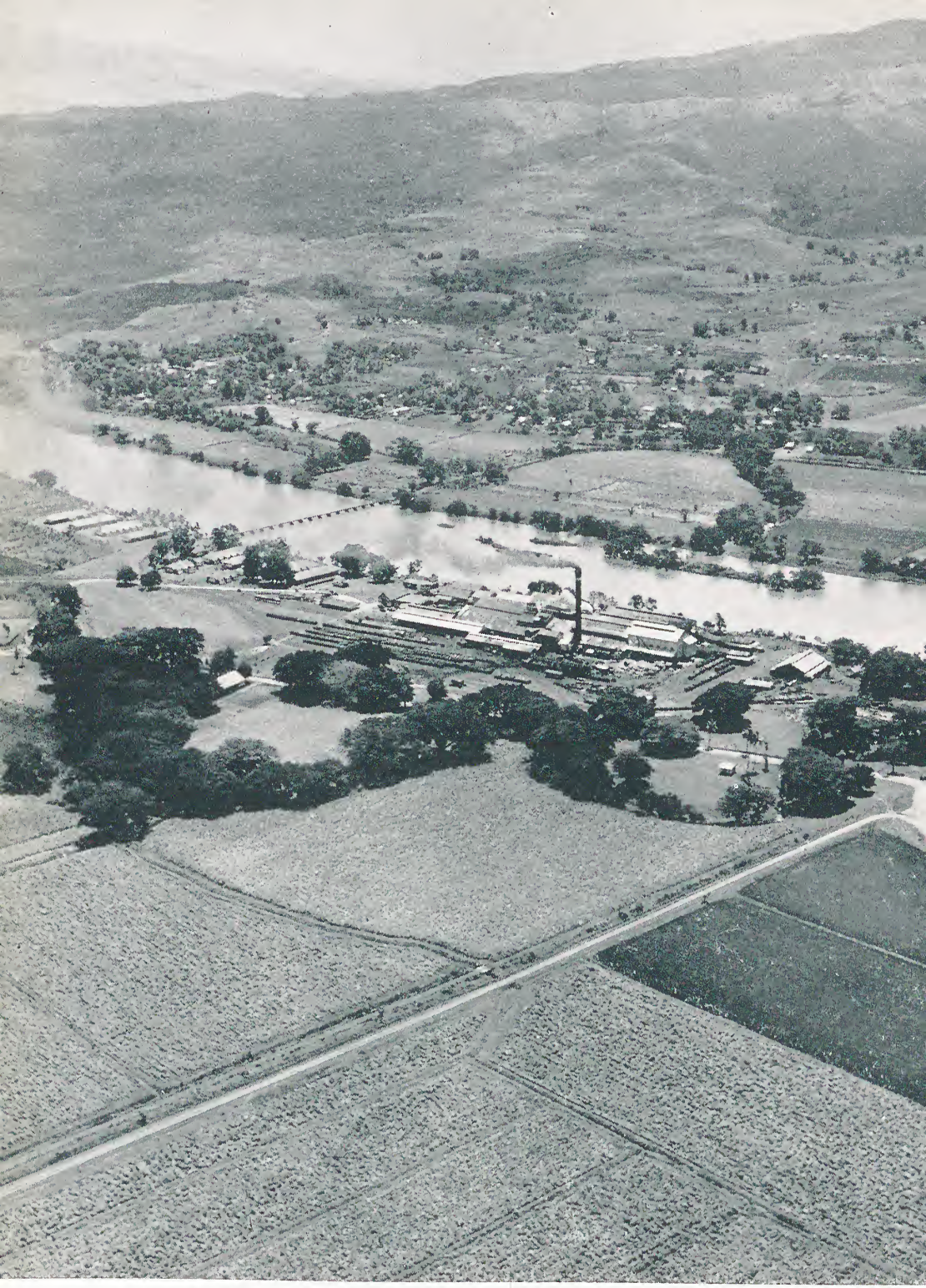
Loading harvested cane. *Fiji official photograph.*

Steam locomotives at Lautoka Mill. Diesel locos are gradually replacing steam.

Above: Locomotive and loaded trucks. Bridges are a costly item of the cane transport service, the whole of which is provided by the C.S.R. Company. *Below:* Punts of cane on the Rewa River bound for Nausori Mill. *Fiji official photographs.*

Cane train at Lautoka Mill. Residential area in background.

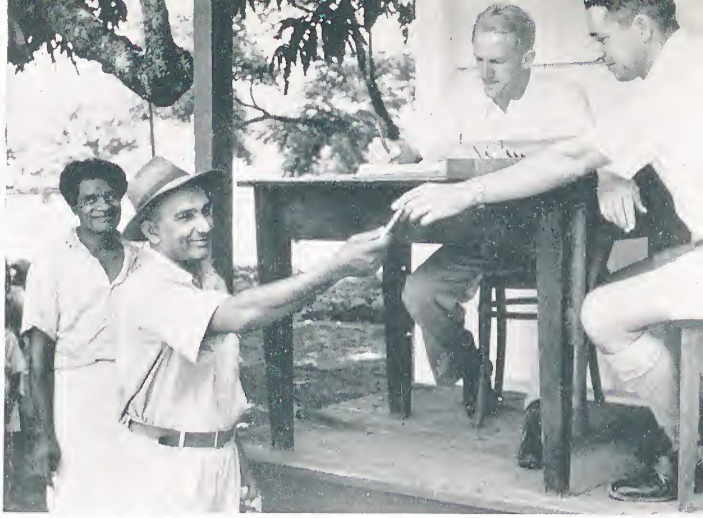
Boiler station, Lautoka Mill. Mill engineers after morning conference.



Rarawai Mill and Ba River.

One of the engines which drive the crushing rollers in a mill. Mill maintenance tools in foreground.

Laboratory, Rarawai Mill.



Paying mill workers.

Farmers receiving progress payments on their crops.

Young field officers, Rarawai.

Senior officers, Nausori Mill, arriving for morning conference.

Instructing workmen, Lautoka.

Administrative office, Rarawai.

Mill officer's home, Lautoka.

Field officer's home, Navakai.

C.S.R. has developed many services for its staff on the dry north-western side of the main island of Fiji. The company subsidizes schools, and operates its own dairy, piggery, beef cattle station and butchery.

Dispensary, Lautoka Mill. The company provides free medical services to its employees and their dependants in Fiji.

the job is essentially done by the co-operative effort of a group of farmers. The fact that the group may contain Fijians, Muslims, Hindus, Sikhs and Christians, men of different races and religions and belonging to different and sometimes opposed political organizations, all working together for several months of the year, is something of a minor social miracle achieved in the name of sugar.

Milling the Crop

The Colonial Sugar Refining Company's main investment is in the transport system and the sugar mills and it is from their operation that it gets its income in Fiji. All of the activities of the company described above are aimed basically at getting a regular supply of high quality sugar cane delivered to its mills at low cost.

There are five of these mills. Four are on the main island of Viti Levu and one, Lambasa, on Vanua Levu. The oldest mill is at Nausori on the Rewa River some 12 miles from Suva, on the "wet" side of Viti Levu. It first crushed cane in 1882. Nausori Mill has a capacity of 170,000 tons of cane in a season of 26 weeks. Its cane is delivered partly by rail, but mainly by punts. A bigger type of punt is also used for the transport of raw sugar to the port of Suva and for carrying mill requirements of coal, bags and other supplies from overseas ships. The cane produced on the Rewa River is of low sugar content.

The biggest mill in Fiji is at Lautoka, where crushing started in 1903. It has a capacity of 600,000 tons of cane per season of 26 weeks and is a big mill, by any standards. Cane is hauled as much as 82 miles from the southern limit of its supplying area, on the Singatoka River, and 22 miles from the northern limit, with an average haul of 27 miles, a feature which is probably unmatched for any mill in the world. Over its 177 miles of permanent line 24 locomotives, 2,700 cane trucks, scores of special ballast, sugar, molasses, passenger and other trucks, are operated. In addition 67 miles of portable line are used for removing the crop from the fields. The company has its own wharf and port facilities at Lautoka, the principal installation in Fiji outside Suva. Bagged raw sugar from the Rarawai Mill as well as from Lautoka is exported from here, the two mills making up 70 per cent of the colony's output of sugar.

The Rarawai Mill is beautifully situated on the Ba River. It is the second biggest mill in Fiji with a capacity of 330,000 tons of cane per season. It was built by C.S.R. and started operations in 1886.

The fourth mill is at the most northerly point of Viti Levu at Penang.

This mill is the smallest owned by the company in Australia or Fiji, with a capacity of 95,000 tons of cane per season. It was started by two brothers in 1880 but was taken over by the Melbourne Trust Company in 1890. It was closed down after losing money during the sugar slump in the early 1920s, later re-opened and was finally bought by C.S.R. in 1926.

The remaining mill is at Lambasa and is the only one on Vanua Levu. It was built by the company, started to crush in 1894 and today has a capacity of 170,000 tons of cane in a normal season. Its supplying area has an interesting feature in that much of it has been reclaimed from "tiri", or mangrove swamps, and is protected by miles of sea walls.

In simple terms, the manufacture of raw sugar from cane involves crushing the cane between heavy rollers, clarification of the juices and their concentration by evaporation of water under vacuum, crystallization of the sucrose in this concentrated syrup, and the final separation of the crystallized sucrose from molasses by centrifugal force. The crystallized raw sugar is then dried and bagged, ready for shipment to the overseas refineries.

These processes involve, however, a combination of chemical and engineering skills of a high order and they demand organizational skill in handling the cane, with some 26,000 tons per week entering the largest mill. The mills are big factories which with their transport and accommodation services represent capital investments, at today's replacement cost, of about £7,000,000 in the case of Lautoka Mill and well over £1,000,000 for a small mill such as Lambasa, Nausori or Penang.

Many of the chemical and engineering controls which are maintained over every part of the milling process have been developed by the company. A vast number of detailed observations are recorded throughout the milling process—temperatures, pressures, densities and many other chemical and physical factors. These are summarized each week on four main work sheets, each of which has from 200 to 400 entries and is confined to one of the four principal operations, such as the "crushing station" or the "boiling house". These four work sheets are then summarized on a manufacture report containing about 200 separate figures from which the efficiency and overall results of the week's work are analysed. One of the end figures is the "Coefficient of Work", a figure which shows the relation between tons of P.O.C.S. (Pure Obtainable Cane Sugar), as measured by weighing and sampling the cane entering the mill, and the tons of raw sugar of standard quality actually produced. Further, there is a

"Chemical Balance" which reveals where all the sucrose originally entering the mill in the cane finally goes: into salable products or lost or not recovered. Other sheets record the main engineering data for the week.

These reports not only provide a measure of results for the mill staff but are also sent weekly to the head office of the company in Sydney for further analysis and comparison with other mills by the company's senior technical and management executives. There is a degree of control, checking and supervision, which has brought the recovery of sugar to a very high level.

This performance is important to the growers as well as to the mill owners since the price for cane depends partly on the efficiency of the mill in extracting sugar. The reputation for honesty and efficiency of the company seems to exist almost unquestioned and it has been well-earned and is jealously guarded.

A sugar mill operates twenty-four hours a day for 5½ days a week during the "crush". Only minor repairs and adjustments can be made during the week-end, so that major breakdowns would involve growers and millers in considerable loss. The complete overhaul of massive machinery and equipment, the replacement of defective parts and the installation of new equipment have to be carried out in the five or six months of the "slack". In recent years the steam-generating station at Lautoka, the biggest mill, was completely renewed. That at Rarawai, the next in size, is being rebuilt at the present time.

Such replacements, costing from £300,000 to £450,000, carried out at the same time as the general mill overhaul to a time-table which must be kept, in places where there are no engineering facilities other than the mill workshop, demand a high standard in engineering staff and organization. The company's workshops in Sydney and the design and purchasing facilities at the head office are also of great value. Dependable transport of equipment and supplies from Australia is provided in the company's own ships, three of which ply between Sydney and the Fijian and Queensland ports, and they carry bulk molasses back to a distillery in Australia.

As seems inevitable, the chief engineer of the mill, always known as "Chief", is usually a Scot, perhaps once removed via Australia. The other engineers, the mill manager and chemists, weighbridge clerks and transport officers are mostly Australians with a sprinkling of New Zealanders. The remaining mill personnel are Euronesians, Indians and Fijians. The productivity of labour on the milling side is about one-third of that in Australian mills but at least as good as in mills in South Africa or the West Indies. To quote one of the redoubtable

"Chiefs", "in relation to the speed and quality of the work done, labour is very little cheaper here than in Australia and, bearing in mind the extra capital in providing houses, free lighting and water, and the greater degree of supervision necessary, I think our labour costs are about the same as in Australian mills".

An interesting example of the need for self-sufficiency imposed by the isolated locations of the mills is the company's 16,000 acre cattle property at Yang-gara, with its herd of 4,000 Hereford cattle and its fine imported bulls. This was established to meet the need for a regular and cheap meat supply for the European and Euronesian employees. For similar reasons the company established dairy herds at some mills, the largest, at Lautoka, comprising over 140 cows. Both meat and milk are sold to the company's employees at low prices as some offset to the higher cost of many other essentials.

The Purchase of Cane

There must always be a clash of opinions and interests in determining the price paid to growers for their cane. Until 1940, the growers were paid a basic price for cane of standard quality, with increases or decreases according to its sugar content. A bonus was added to give growers the benefit of the Empire Tariff Preference. The millers carried the vicissitudes of fluctuating prices in world sugar markets, with good profits in some years (a long way back) and very considerable losses in other years.

Wartime sugar price arrangements removed the dangers of fluctuating prices and in 1940 a new basis was introduced whereby the farmer and the miller both shared variations in the price received for sugar. The payment to the individual farmer according to the quality of his cane was discontinued, at the request of many of the farmers. A price was determined on the season's average yield of all cane crushed at a given mill and the overall price received for sugar.

These general principles were continued in the Purchase of Cane Agreement signed between the company and the growers in 1950 to cover a ten-year period. The price per ton of cane is fixed from a scale according to the number of tons of cane required to make 1 ton of 94 N.T. (*net titre*) sugar. To this scale figure is added a bonus, which increases on a sliding scale up to 2*s* 1*d* for every £1 by which the proceeds of 94 N.T. sugar exceed £11 per ton f.o.b., and there are one or two less important adjustments.

The average price per ton of sugar cane paid to all farmers in Fiji increased from 23*s* 8*d* in 1943 to 36*s* 5*d* in 1949. Mainly due to the

increase in the price of raw sugar, the price rose to 71*s* 6*d* in 1953 and the estimated price for the 1954 crop is 71*s* 0*d*.

The increased prosperity of the farmers can be seen on many farms where thatched grass huts are being replaced by small, attractive cottages. As mentioned earlier, tractors have been bought and are effecting a major change. Some of the Indian leaders deplore the failure of thrift to accompany this prosperity and are concerned at the continuation of the traditional tendency of the Indians to borrow heavily from Indian moneylenders, who continue to hold many farmers in their grip at 20 per cent interest, though some farmers are turning to the banks and reputable lending institutions. C.S.R. continues to provide cash advances at a low rate of interest for normal living and farming needs, but only to an amount less than the value of the crop existing on the farm.

While the farmer has prospered, the company, on the other hand, claims that at present sugar prices the sliding scale of bonus payments does not leave it a commensurate share, especially in seasons when the quality of cane is below normal. If this means that mill and transport modernization do not proceed as far as they would with bigger profits, then the industry as a whole will suffer, especially if sugar prices fall. Payment for cane on the basis of average quality and the abolition, in the existing form of cane purchase, of payment to individual farmers according to the quality of their own cane also present real problems, especially at Nausori Mill where the cane is generally of low quality and the operations are currently at a loss.

Marketing Fiji's Sugar

Fiji's sugar industry depends almost entirely on export markets, for local consumption is relatively insignificant. World production of sugar had exceeded effective demand for many years before 1940 and world sugar prices had been severely depressed. Cane prices were so low that farmers had little chance of improving their living standards while the milling section of the industry had shown, at best, an inadequate return on capital. For many years the millers had faced real problems in improving their mills and, as the bodies closest to the growers, had received an undue share of criticism from the growers. The people of the industrialized nations had benefited from cheap sugar produced by people with very low standards of living.

Great Britain and Canada had helped with Empire Preference and the situation was brought nearer to equity by the signing of the British Commonwealth Sugar Agreement (B.C.S.A.) on 21 December 1951.

This agreement has already been dealt with in the chapter "The Structure of Sugar Markets", and we will here describe only its impact on Fiji.

For Fiji it meant a large measure of security for eight years ahead. Total exports were not to exceed 170,000 tons in any year, a figure considerably above its then production but not in excess of the mill capacity. Of this production an amount of 120,000 tons, later increased to 125,000 tons, was to be purchased each year by the United Kingdom at a "negotiated price". The remainder of the exports above the "negotiated price quota" were to be sold on world markets at ruling prices, with the benefit of Empire Preference when sales were effected to the United Kingdom or Canada.

The International Sugar Agreement, signed at London in October 1953, incorporated the figure for total exports from Commonwealth producers already established in the British Commonwealth Sugar Agreement.

These two agreements greatly improved the long-term economic outlook for the sugar industry in Fiji. They assured markets at far more equitable and stable prices than in the past and they presented the opportunity for a considerable increase in production.

A basic feature of the "negotiated price" to be paid by the United Kingdom was that it should be a price which "shall be reasonably remunerative to efficient producers" and which "shall be a single Commonwealth price applicable to all Exporting Territories". Production of cane in Fiji was at a high level of efficiency, while the company's mills were at least as efficient as the best mills in the world. The industry as a whole could expect to enjoy reasonable prosperity if inflation could be kept out of the picture.

The agreement has a special significance for Fiji in relation to costs and the future of the "negotiated price". This price is varied each year "to reflect changes in the level of wages and other cost factors" in *all* the exporting territories. Fiji's share of the total amount in the "negotiated price pool" is only eight per cent. Therefore if costs including wages rose more steeply in Fiji than in other Commonwealth exporting countries, the influence of Fiji costs on the "negotiated price" would be small, so that the price received by Fiji would not keep abreast of increased local costs. This is a powerful sanction against inefficiency and high costs in the Fijian industry.

The B.C.S.A. aimed to develop the production of sugar within the Commonwealth. Fiji has played its part. The area devoted to cane farming has been increased since 1950 by nearly 20 per cent to 110,854 acres. Much of this increase was by expansion of "lorry areas" not

directly accessible by rail: cane is brought from these areas to the main line by motor trucks. At the same time, production was increased by the changeover from a 25 per cent crop cycle to a 33 per cent cycle, as described earlier. The total area of plant and ratoon crops actually to be harvested in 1955 will be about 65,000 acres, an increase of 45 per cent on 1950.

Increases of this magnitude and speed in agricultural production represent a major achievement by all parties. In the process, the standards of agricultural practice were, perhaps, not improved as much as they might have been and certainly not as much as in Australia. But the production target was reached and the task of further improving agricultural methods can now be tackled.

This expansion has staved off for some years the problems which were arising with a rapidly increasing population in an industry which was poor and had reached the limits of expansion with existing markets. Today Fiji has full employment with some minor shortages of labour in the sugar mills and for some kinds of agricultural work such as cane cutting and drainage, although these shortages are largely due to the fact that many Indians prefer a higher degree of leisure to a higher level of income.

Industrial and Social Relations

The troubled times of the early 1940s saw the rise of strong labour unions and farmers' associations in Fiji. These groups have attained strength, their leaders have shown skill in negotiation and they hold positions of great responsibility in the economy.

A single union, the Chini Mazdur Sangh (Sugar Workers' Union), represents Indian and Fijian labourers employed in the mills, on the transport system, and in allied parts of the industry. The headquarters of the union is at Ba in the Rarawai Mill area and it handles all matters generally affecting the industry in Fiji. There are branches at each mill and local matters are handled between the branch and the local company manager.

Collective bargaining and joint consultation between C.S.R. and this union have proved an outstanding success. Both parties are satisfied with the system and do not desire intervention from any outside arbitration authority. The success of the system stems mainly from mutual confidence and goodwill, with each party respecting the other's right to drive a hard bargain and also recognizing the other's problems and responsibilities. Both parties have scrupulously honoured agreements. The last strike of the Sugar Workers' Union in Fiji was in

1950, affecting one mill only, and the one prior to that was in 1943. Both were of very short duration and they were the only two strikes of C.S.R. employees in the last 30 years.

A small incident seen personally may illustrate this situation. A "roguing" gang of twenty-two Indians was sent into an area of tall cane to dig out and destroy any diseased plants. They found that hornets were bad and they refused to enter the area. A company officer then suspended them, his main concern being that the diseased cane must be destroyed for everyone's sake. He reported the matter to his manager who immediately sent word to the union officials that he would investigate and would meet them at seven o'clock next morning. In the meantime arrangements were made for special "hornet suits" to be available. At the conference the importance of the work was stressed, the manager told of his plans for extra men to burn out hornets' nests and for hornet suits to be provided, and the work went on. One cannot help contrasting this incident with scores of similar situations in certain Australian industries where there would have been widespread stoppages while the matter went to a Conciliation Commissioner or Industrial Tribunal.

The *Annual Report of the Commissioner of Labour, Fiji,* for 1953, presented to the Legislative Council, states in regard to mill labour in the sugar industry:

> It is in this industry that collective bargaining has proved most successful over the last six or seven years, and in which the relations between the employer and the employees so nearly approach the ideal. In March 1953 the company's officers had their annual conference with the union delegates. The Chief Manager and eight other managers and senior officers represented the company and twenty-five delegates the Sugar Workers' Union, the latter being assisted, with the employers' concurrence, by the President of the Fiji Industrial Workers' Congress.

The union has won considerable gains for its members. Taking 1939 as the base year, with an index of 100, actual wages paid have increased by 1955 to 400, while the official cost of living index has increased to 311. Although it is the farmers who have benefited most in recent years, these figures show that the real standard of living has improved also for the union members.

Apart from wages, the company gives many concessions to its employees, such as cheap sugar and firewood, and also some items which originated in the days of indentured labour. One of these survives from the days when an Indian would take two weeks off work when

Indian cane farmers' wives.

C.S.R. training farm for Fijian youths, Drasa, Fiji.

Rarawai Mill canelands, Ba River, Fiji.

Lambasa Mill, Fiji.

Cane arriving at Lautoka Mill, Fiji.

Indian cane farm, Nandi, Fiji.

Newly developed cane farms, Sambeto Valley, Fiji.

his wife was having a baby. If this happened at a rush period, as at harvesting, the company would pay him the equivalent of two weeks' wages to hire a nurse. This is continued even today by the token payment of a "midwife concession of £1 per accouchement" to an employee who has been with the company for at least two months.

Medical treatment and dispensary services are available at each mill. In the old days there were three medicines—quinine, a purgative, and a peppermint cough mixture. Today a full range of modern drugs is dispensed free to all Indian and Fijian employees, their wives and dependent children.

C.S.R. has for many years played an active part in education. It has conducted primary schools at its mill centres for European and Euronesian children, subsidizes mission schools and assists Indian and Fijian schools.

There are seven different "Industrial Associations" of cane growers. Most of them were associated with a particular religious or racial group in their origin, although they are not exclusive in their membership. These associations are generally active in the colony's politics and are used by some of their leaders in seeking election to the Legislative Council. This has complicated some major matters in the past. In the negotiations over the Purchase of Cane Agreement in 1950, some of the associations were agreeable to the final details and they all played a big part in the hard bargaining which finally produced terms that eventually proved more favourable to the growers than to the company. But the associations were divided and a difficult situation arose. There was some doubt whether the new agreement would be accepted but the difficulties were finally overcome when 80 per cent of the growers signed as individuals.

In the past five years relations between the associations and C.S.R. have shown steady improvement and this is due not alone to the favourable economic position of the farmers, nor to the fact that some of their leaders have gained more experience and understanding of the quite complicated considerations which affect the well-being of the growers and industry as a whole. Equally important has been a change in the company's attitude to the leaders of the associations. Initially they were scarcely recognized as responsible representatives of their members and some of the old autocratic attitudes of senior company officials towards the Indians were slow to disappear. Today greater confidence, co-operation and understanding have been established.

The company and the farmers' associations have, in the last few years, worked out solutions to some matters which previously would have caused interminable dispute. One of these was the allocation

of surplus funds accumulated from certain export sales; another was the continuation of an industry stabilization fund. The creation of a sugar board, as previously advocated by the associations and recommended in Professor Shephard's Report of 1945, was successfully opposed by the company on the grounds that it would achieve no constructive purpose and would create new problems. Today nearly all the farmers' associations are coming to realize that consultation and negotiation with the company are possible and satisfactory. The Government of Fiji is kept fully informed of all aspects and peaceful conditions are maintained in this key industry.

The improved co-operation between the company and farmers' associations was seen at Nausori Mill in the 1954 planting season. As mentioned earlier, this mill is in a "wet" zone where the quality of the cane is low and, under the existing Purchase of Cane Agreement, the company has made substantial losses at Nausori. The position was aggravated by the fact that an inferior variety of cane called Malabar, which gave high tonnage but low sugar yield, was being planted against the advice of the company. Malabar, however, would grow on land where the drainage had been neglected and which would not grow better varieties without hard work in cleaning out and rebuilding drains. The company called a conference of the association leaders, explained the situation and sought their co-operation. As a result, the area of new planting of Malabar was reduced from 34 per cent in the previous season to 15 per cent in 1954.

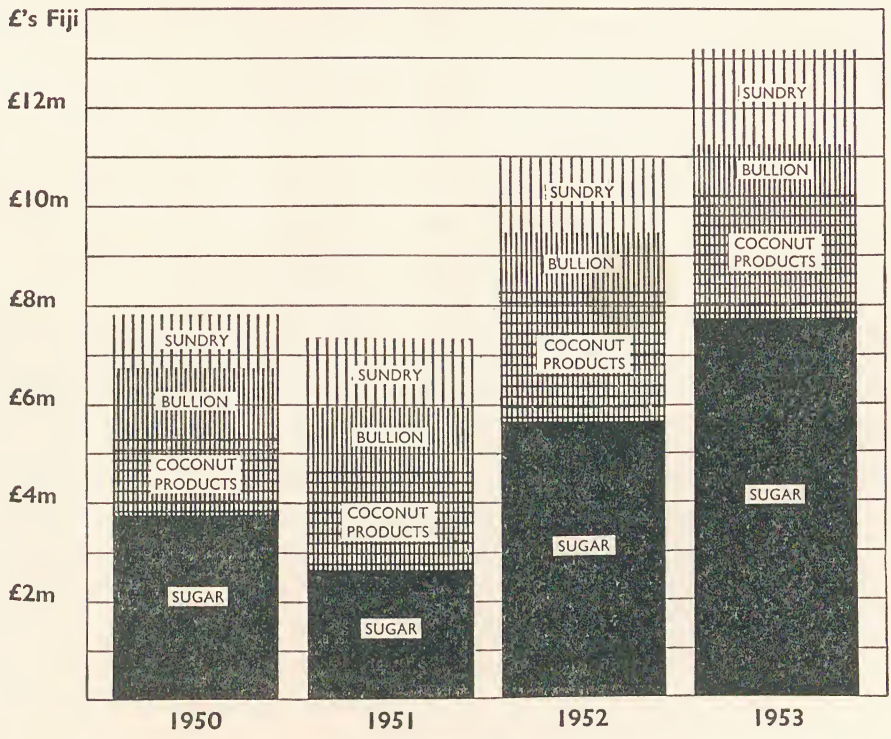
In this and many other ways, it has been amply demonstrated that discussion, exchange of information, and co-operation can provide a way of peace and progress. There is some danger that the farmers' associations may be used as political weapons, although one hopes never again to the same degree as the industry was used politically by agitators from India during the struggle for India's self-government. There are still political issues which are quite separate from the sugar industry and the farmers have a vital stake in seeing that they themselves are not used for political ends.

The Company's Position in the Economy of Fiji

The sugar industry is the backbone of the economic and social order in Fiji. The strength of the industry is inextricably linked with the achievements of a capitalist company which holds an apparently monopolistic position. The words "capitalist" and "monopoly" have become somewhat tainted throughout the world by the political and economic arguments of the last fifty years. Let us examine how the

company's performance and policy in Fiji stand up to some of the standard criticisms of "monopoly".

First, there is the stock criticism that monopolies squeeze out competitors by unfair practices. There were originally a score of different milling organizations in Fiji but only three companies survived the depression of the 1880s. Two of these, although operated by substantial overseas concerns, failed in the 1920s through production and labour problems combined with low sugar prices. The Colonial Sugar Refining Company survived all the problems which defeated other mills, operating under quite equal and competitive conditions, because of its financial strength, soundness of judgment in the location of its mills, outstanding technical and managerial ability, based largely on its resources and background in Australia, and, by no means least, courage and determination to survive periods when the outlook must have seemed hopeless. Without these qualities and resources, the company might well have withdrawn from Fiji, as did other organizations, and the whole economic and social picture in the colony would have been infinitely poorer.



VALUE OF EXPORTS—FIJI

Inefficiency, due to the absence of competition, is a charge which no opponent of the company could reasonably raise. Its mills in Fiji have a standard as high as the best in the world. This statement is based on detailed comparisons of the many technical and scientific measurements of recovery of sugar from cane treated and on the general engineering efficiency of the plant.

Has the company used its position of single buyer to force unfair prices on its suppliers? Anyone who imagines that this would be possible must be unaware of all the social and political forces which create a balance of power in these things. The President of the Kisan Sangh, one of the leading farmers' associations, was able to say, however, in a public address on 31 December 1954 that "I believe the price paid for sugar cane is the highest in the world".

Has C.S.R. used its position to make excessive profits at the expense of other parts of the industry? About 35 years ago the company made high profits, for a short period, out of abnormally high world sugar prices—and so did the independent planters of the time. Professor C. Y. Shephard examined the company's profits in his report of 1945. He found some difficulty in assessing the capital employed, as was inevitable in dealing with a long-established company with old assets. There was also some difficulty in deciding a proper allowance for depreciation, and the inflation which followed showed that the allowance he made was too small. Professor Shephard's main conclusions were that "the profits of the company since 1930 . . . have been of the order of 3 per cent per annum" and "represent, in my opinion, an unattractive return on the capital invested". The position has improved in the last few years but the company claims that profits are still inadequate in relation to the size of its investment.

Any impartial assessment of the company's achievement in Fiji must give it high praise, not only for its physical and economic results but also for its contribution in the sphere of social and human advancement. The company's contribution has been based on a tradition of responsibility and efficiency, expressed through the high morale and *esprit de corps* of its staff which represents the company in the eyes of the farmers and sugar workers. Goodwill and sound relations have been developed between this modern capitalist organization and peoples of many races and religions in a way which might be envied in many troubled parts of the world.

CHAPTER 5

The Australian Sugar Industry

H. W. HERBERT

This survey was originally written for C.S.R. early in 1955 as an examination by an economist of the industry as a whole. The company wanted an independent study to issue in response to the numerous requests it receives in the southern states for information on the Australian sugar industry. Mr Herbert investigated the industry on the spot and talked to farmers, millers, government officials, bank managers and many others closely acquainted with the industry. It was later decided to include his survey in this book because it provides a description of the whole Australian industry by an independent observer and serves as a background to more detailed description of the company's activities.

Mr H. W. Herbert studied at Roseworthy Agricultural College, farmed wheat in South Australia and read economics at Melbourne University. Later he became a research officer of the Queensland Bureau of Industry and is now in private consulting practice in Brisbane as partner of Mr Colin Clark in Economic Services.

May 1955

THE Australian sugar industry has some remarkable features. It is the only sizable cane sugar industry in the world operated solely with white labour, and has resulted in the most successful settlement of white men in the tropics ever. It is spread out in 9,000 farms along 1,200 miles of coast from the Clarence River to Mossman, north of Cairns, yet in some ways is the most tightly organized industry in Australia.

Its workers have much higher incomes than sugar workers in any other country, excepting only Hawaii and Louisiana which sell all their sugar on the protected American market. The Australian sugar industry for the last twelve years has averaged well below world prices for its output, and yet has provided wages and incomes far above coloured-labour standards, which indicates, on the face of things, a high level of efficiency.

This efficiency is indeed outstanding in many respects. The growing of cane on the farms has been completely mechanized. The horse has disappeared from the cane fields and so has the hand hoe. Cane harvesting is still largely done by hand; only in Hawaii and Louisiana, and to a very minor extent in Queensland, is cane mechanically harvested. But Australian cane cutters cut and load cane at two to three times the rate of plantation labourers in other countries.

Australian farmers get a high yield of sugar per acre—over three tons, compared with less than one and a half tons in 1900. The amount of scientific research and experiment to improve cane-growing in Australia is impressive and the speed at which the results are applied by the farmers is almost a legend. In standards of efficiency the thirty-four raw sugar mills and the six sugar refineries in Australia will bear favourable comparison with the world's leading mills and refineries. The transport of the huge weight of sugar cane, amounting to ten million tons in 1954, from the farms to the mills is mainly over some 2,000 miles of narrow 2 ft. gauge tramway lines, provided by the mills, at a cost per ton-mile lower than the rate charged for cane on the Queensland Government Railways. The mills provide this light gauge railway system which is nearly half as long as the total Victorian State Railways system. Over one of these toy railways across a main street in Ingham last season passed more than 500,000 tons of cane.

A constant ferment of technical improvement over the past seventy years or more has gradually transformed the Australian sugar industry into something vastly different from what it was with its Kanaka labour, its diseased and pest-ridden cane fields, and its 250 mills, mostly small and inefficient.

Yet the industry by no means gets unanimous Australian approval

and support. In the southern Australian states, in particular, there has in the past been strong opposition, some of which still continues, to the "privileged" position of the Australian sugar industry "supported by high home prices for sugar and an embargo on imports". Some of the criticism is fair-minded but some neglects to take into account what has happened in the sixteen years since 1939.

Before 1921 Australia grew only part of its sugar needs and, during the first World War, had to pay some fantastically high prices for imported sugar. In 1920 the Hughes Government substantially raised the price for Australian raw sugar to stimulate the industry to increased production. It succeeded too well. The best-laid schemes of men often go most awry when caught in an unexpected economic rip-tide. By 1925 Australia was producing a substantial surplus for export, and in that year world sugar prices fell from their post-war levels. They paused briefly, then gradually declined to their lowest point in the depression years, "dumped" refined sugar falling as low as £10 per ton, landed Australian port, which was only one-third of the home consumption price. The industry found the going rough, though some other farmers, such as wheat growers, were even worse off. The home price for refined sugar had been reduced by some 11 per cent and there were cries for further reductions or for abandoning this "artificial" industry. The critic in 1940 could point back to seventeen consecutive years in which some sugar (admittedly dumped) could have been imported below the Australian home consumption price.

Australian consumers had paid per head about £1 a year in higher prices for sugar to keep this major industry in existence in tropical and subtropical Australia. And, in view of what shortly followed, this proved valuable insurance.

The so-called "world price" for sugar applies only to a very minor part of the world sugar trade. It is mainly determined by Cuban exporters who have some sugar to sell on the "world market" after the bulk of their crop has been sold on the protected American market.

The second World War lifted "world prices" consistently above the Australian home consumption price and created sugar shortages. "World prices" climbed even further post-war; in 1950-51 to more than twice the Australian price. Britain pressed the Commonwealth sugar countries, including Australia, to grow and send her more sugar, largely to save dollars. For ten years, from 1942 to 1952, Australian consumers got cheaper sugar than they could have imported. They probably saved at least £1 a year per head, and in some years they would almost certainly have gone very short of sugar in the absence

of the Australian industry. Australians would have had a long period of sugar rationing, as did the British people. Industries such as fruit canning might have gone out of business.

The reader must also assess for himself the value of two other factors, one from wartime and one from postwar years. Strategically, the sugar industry in northern Queensland helped to turn the war against the Japanese, in particular by rushing good tractors from nearby farms to build the emergency airstrips which were so important in the Coral Sea battle. In the field of international politics, Australia's moral and diplomatic position is considerably strengthened by the use the sugar industry is making of tropical Australia and by the population and development it has brought there. This may be even more important in the future than it has been in the past. For these reasons all political parties in the Federal Parliament have consistently supported the Australian sugar industry.

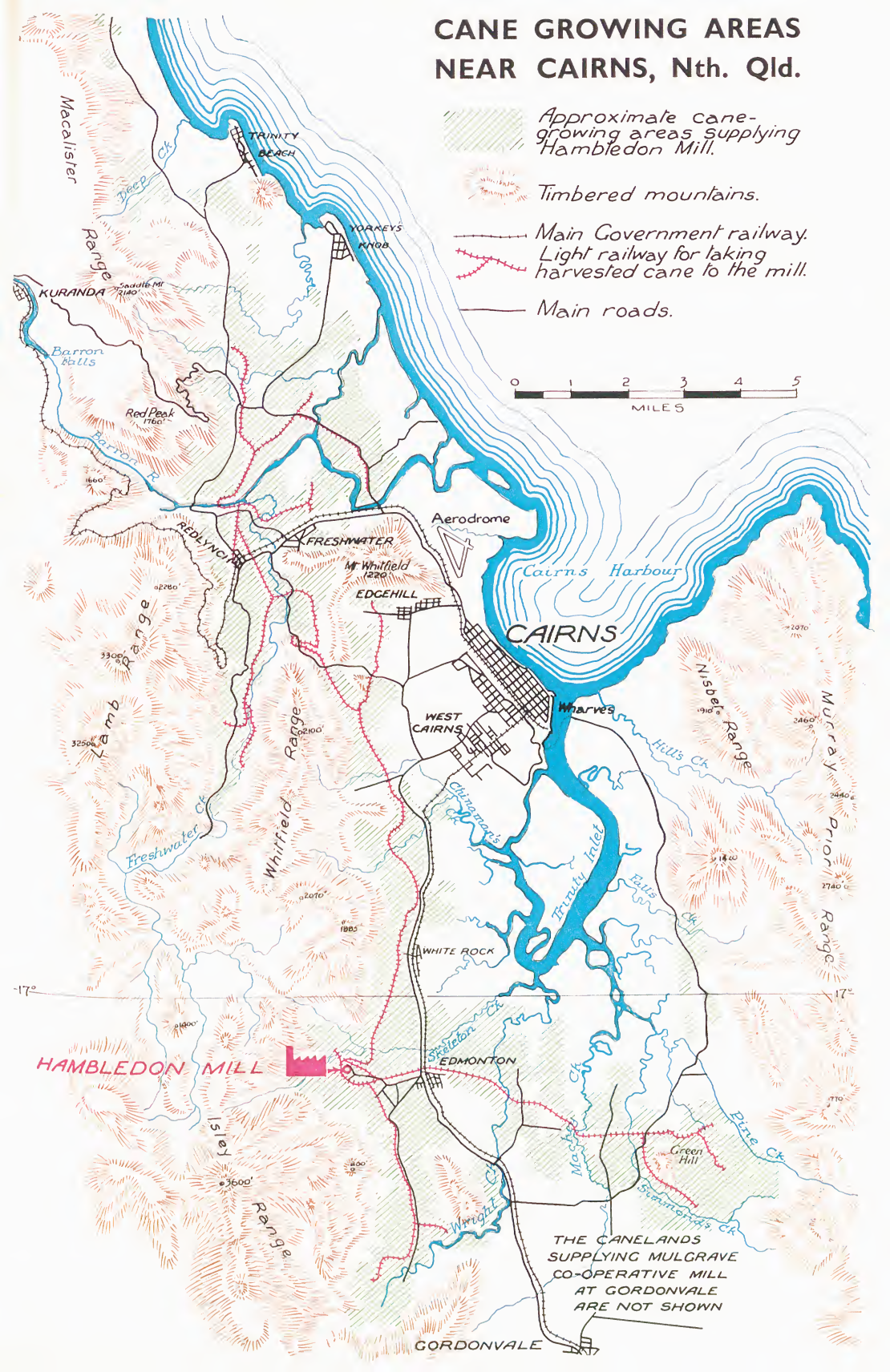
After ten years the tide has turned slightly and refined sugar could now be imported into Australia at slightly less than the home consumption price. At the same time the Australian home retail price of ninepence a pound is still one of the lowest in the world.

The first major weakness of the sugar industry, which it shares with many other Australian export industries, is the way it has been caught with rising costs by the great Australian inflation of 1950-52. A good plan has run into an unexpected and adverse economic current.

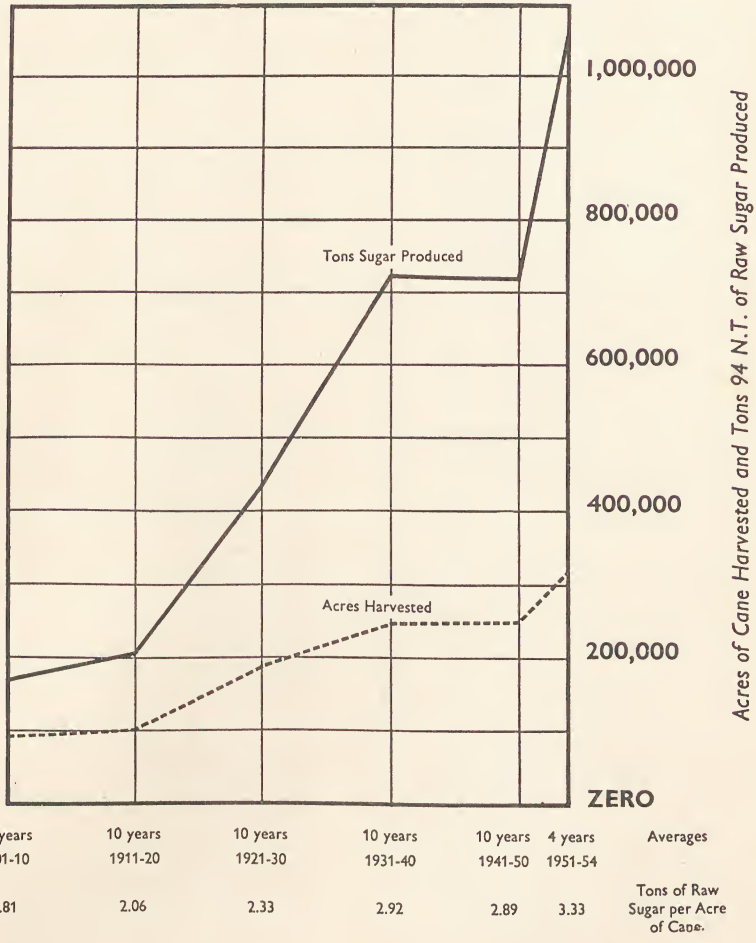
In 1950 the industry decided to expand, substantially but cautiously, after a Royal Commission inquiry and much thought, to a new annual level of 1,100,000 tons of raw sugar by 1953, compared with less than 950,000 tons in the best postwar year. The target was subsequently raised to 1,200,000 tons for 1954-55. The expansion was achieved by opening some new lands for new cane farms (including farms for soldier settlers) and by expanding the unduly small areas to which many growers had been restricted. To cope with the increased crop, all mills made improvements and some of them undertook enlargements. Victoria Mill at Ingham, in particular, was duplicated to make another 40,000 tons of sugar a year, mainly from the entirely new Abergowrie cane area. Since 1950 the sugar mills have spent about £13 million on capital improvements and the farmers have spent even more.

Science and nature helped, with increasingly good control of cane pests and diseases and with good seasons, and in 1954 a total of 1,300,000 tons of raw sugar was made.

This was a carefully planned expansion, compared with the unplanned expansion after World War I. A long-term market, particularly with Britain, had been arranged in advance. Only the last half of


CANE GROWING AREAS
NEAR CAIRNS, Nth. Qld.
Approximate cane-growing areas supplying Hambledon Mill.
Timbered mountains.
Main Government railway.
Light railway for taking harvested cane to the mill.
Main roads.
0 1 2 3 4 5
MILES
Macalister Range
Deep Ck
TRINITY BEACH
YORKEYS KNOB
Barron R
KURANDA
Saddle Mt 2140'
Barron Falls
Red Peak 1760'
1660'
REDLYNCH
FRESHWATER
Aerodrome
Mt Whitfield 1220'
EDGEHILL
Cairns Harbour
CAIRNS
Lamb Range
3300'
3250'
2280'
2100'
Whitfield Range
Freshwater Ck
WEST CAIRNS
Wharves
Nisbet Range
Hill's Ck
Murray
Prior Range
2460'
2440'
2740'
Chinaman's Ck
Trinity Inlet
Earl Ck
WHITE ROCK
2070'
1985
1400'
17°
HAMBLEDON MILL
Skeleton Ck
EDMONTON
Isley Range
3600'
Mc Ck
Green Hill
Pine Ck
Wright Ck
Stumm Creek's Ck
THE CANELANDS SUPPLYING MULGRAVE CO-OPERATIVE MILL AT GORDONVALE ARE NOT SHOWN
GORDONVALE

INCREASING YIELDS IN AUSTRALIAN RAW SUGAR INDUSTRY



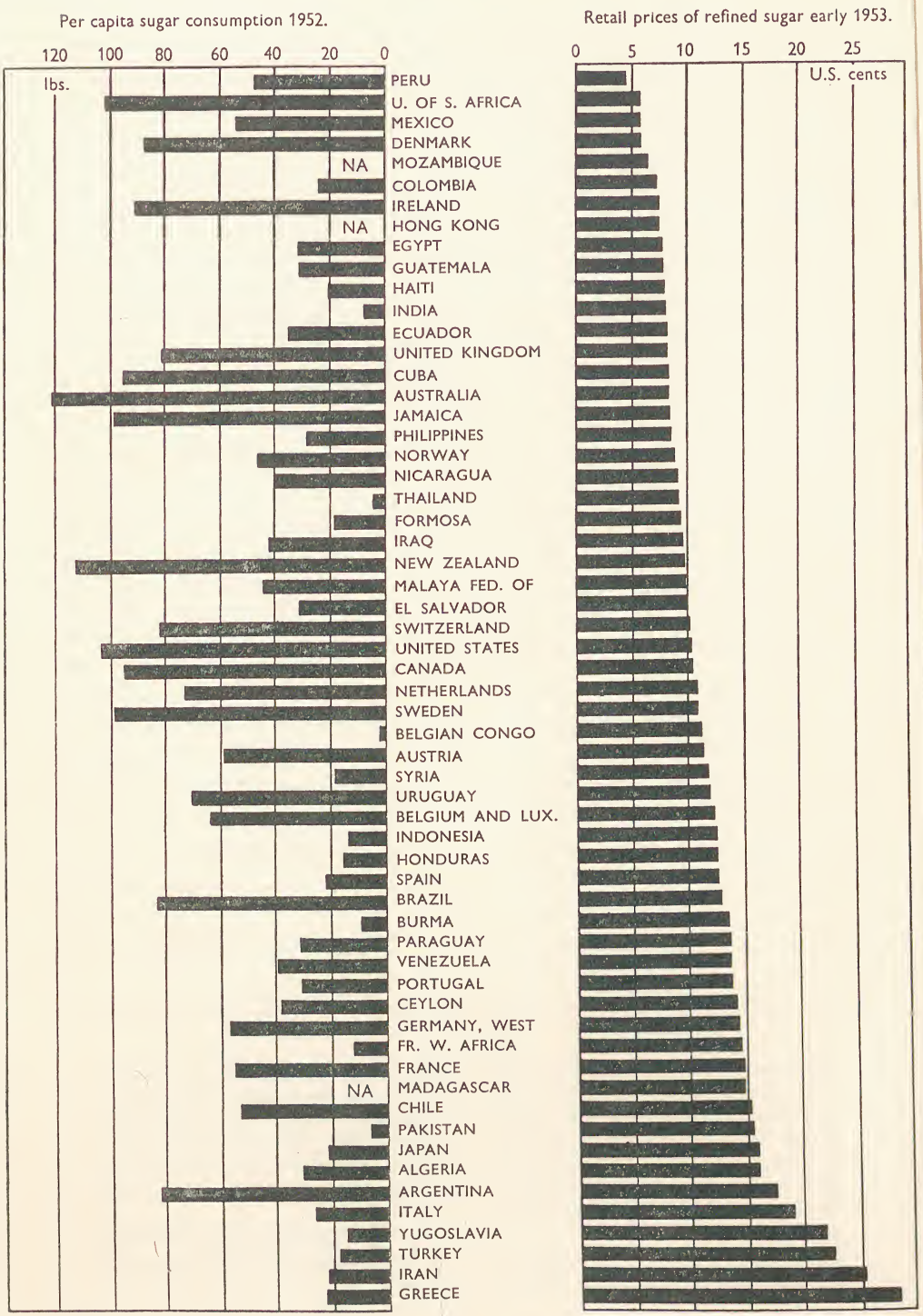
10 years 1901-10	10 years 1911-20	10 years 1921-30	10 years 1931-40	10 years 1941-50	4 years 1951-54	Averages
1.81	2.06	2.33	2.92	2.89	3.33	Tons of Raw Sugar per Acre of Cane.

Yields per acre of raw sugar from Australia's cane farms have increased primarily because of greatly improved varieties of cane. Most of these new canes, which are rich in sugar and resist diseases, have been bred in Australia by the Queensland Bureau of Sugar Experiment Stations and by the C.S.R. Company.

Other factors which have helped to increase yields are improved cultivation implements and agricultural practices; heavier and more skilful manuring; increased growing of leguminous green manure crops; chemical control of cane pests; increased and more efficient milling plant, and improved milling technology.

Sources: Annual Reports Queensland Bureau of Sugar Experiment Stations and C.S.R. Records.

PRICE AND CONSUMPTION OF SUGAR IN VARIOUS COUNTRIES



Australia is among the countries having relatively low retail sugar prices. Low prices tend to be associated with high consumption and vice versa. Consumer purchasing power is also an important factor affecting sugar consumption. *Source of data for graphs above—U.S. Department of Agriculture.*

exports, or one-quarter of total production, is sold at the "world price". During the 1950-54 expansion the "world price" fell back, but far more serious was that Australian costs doubled during this period. What seemed a wonderful prospect in 1949 looked rather sour in 1954.

It is true that there has been some over-production of sugar in Australia in 1954, but it is not a large amount and does not worry the industry unduly. In farming, it is impossible to achieve an exact production target each year. No further collapse of world sugar prices, similar to the calamitous fall of the early 1930s, is expected. For one thing, economic measures to prevent a serious depression are now well known and likely to be applied. Moreover, the world's exporting sugar industries are better organized with the International Sugar Agreement and the British Commonwealth Sugar Agreement. These agreements prevent serious over-production. They do not prevent countries bolstering up their own internal sugar industries by high protection, which in the long run tends to reduce imports of sugar.

The "Negotiated Price" which Britain pays for half of Australia's export sugar is related each year to the average costs of sugar production in the Commonwealth exporting countries. To the extent that Australia can reduce its costs of production compared with the Commonwealth average, it stands to benefit.

Moreover, nearly half of all Australian sugar is sold on the home market and the industry has been able to get a reasonable, but by no means generous, increase in the Australian price. Sugar now retails at 9*d* a pound, compared with 4*d* pre-war, showing an increase considerably less than the average rise in retail prices.

The price of sugar inside Australia is fixed by an agreement between the Queensland and Commonwealth Governments, and each time the price is raised the new agreement has to run the gauntlet of the Commonwealth Parliament. The present price was fixed only after an expert committee had in 1952 held a most searching inquiry into the industry—its costs, its profit margins to farmers, millers and refiners, and its efficiency compared with overseas sugar industries.

The combined political watchfulness of southern consumers and sugar-using industries (especially the fruit industry) keeps a fairly low ceiling on the Australian home price of sugar, and it is a ceiling that will make a tardy rise if there is further Australian inflation.

Thus, in the modern world of uncertain prices for basic commodities, the Australian sugar industry has its market fairly well tied up. In the absence of war it is most unlikely to see any boom prices, but the average price will not collapse. To get this security production has to

RETAIL PRICES OF REFINED SUGAR IN VARIOUS COUNTRIES

Compiled from cabled advices during January, 1955, and expressed in Australian currency at exchange rates then ruling.

SOUTH AFRICA	6½d.
NORWAY	7¾d.
INDIA	8½d.
EIRE	8¾d.
AUSTRALIA	9d.
UNITED KINGDOM	10d.
U.S.A.	10¼d.

SWEDEN	10¼d.
CANADA	10½d.
NEW ZEALAND	11¼d.
FRANCE	1s. 3½d.
ITALY	1s. 8½d.
SPAIN	3s. 10½d.

be strictly limited: a surplus would be completely unsalable in most years. This virtually establishes a definite limit to the gross income from sugar sales in the near future. A bad agricultural season could give a gross income well below this limit, although this would be slightly offset by the fact that the shortage would be in "world price" sugar, which is at present, and is likely to remain, the cheapest of the three categories.

The thing that can most hurt the sugar industry, therefore, apart from a really bad season, is rising cost of production. If its rising costs are due to general Australian inflation, it may get some compensation from a higher home price, but this would be well after the event. It would get a little further compensation from its "negotiated price" sugar but only to the extent that Australian costs are a fractional item (18 per cent) in British Commonwealth export sugar costs. But high cane cutting costs, such as were experienced in 1954 owing to scarcity of labour, are borne by sugar farmers and the dislocation caused to the harvest is a burden to mills and farmers alike.

This leads to the second major weakness of the Australian industry—the high cost in current Australian labour conditions of cutting cane by hand and the difficulty of getting enough cane cutters.

The 6,000,000,000 sticks of cane that constituted the 1954 harvest were nearly all cut and loaded by hand. It costs about fourpence to cut and load every dozen sticks (some £8 million in total). As an average stick contains about ½ lb. of sugar, cutting represents about two-thirds of a penny per lb., or nearly 20 per cent of the 3.7*d* a lb. that the farmer gets for the raw sugar in his cane. When cane

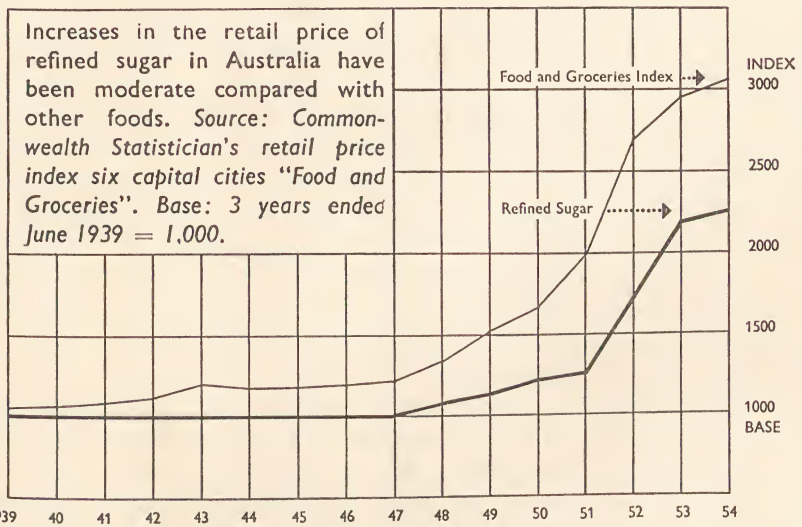
cutters are so scarce that they can demand and get 25*s* a ton for cutting cane against the 15*s* award rate, as a few did in 1954, the farmer really suffers.

Cane cutting and loading is one of the hardest and hottest large-scale hand labour jobs left in Australia, particularly in the hot and often humid weather from September to Christmas. Cane cutters are on piecework and earn good money. They average about £5 per day but only fit and younger men are likely to stay at the work for long.

In 1954 some cutters made more than this (up to £10 a day) as the season progressed, by working hard and getting over-award rates per ton, but the number of cutters still dwindled. Some mills had frequent and expensive stoppages through shortage of cane. Delayed harvesting also hits the farmer, as the sugar content in the cane stalk diminishes after October, when the warm weather re-starts active growth in the plant.

Another source of loss is bad topping of the cane sticks, either by failure to cut off all the leaves at the top of the stick, or by cutting off too much good cane with the top. Topping is, of course, done worst when labour is scarcest. The cane top does not contain sugar but it does contain acids and other substances which make it harder for the

RETAIL PRICE OF SUGAR AND OTHER FOODS IN AUSTRALIA



mills to crystallize the sugar. When a cane top goes through the crushing mills it adds to the juice acids and other matter which attack the sugar and at the same time the extra fibre absorbs valuable sugar; so tops cause a double loss.

Shortage of cane cutters probably cost the industry, in various ways, something of the order of £500,000 in 1954. Naturally, there is intense interest in how to avoid a repetition of this, whether by recruiting and holding more cutting labour or by doing either the cutting or the loading mechanically.

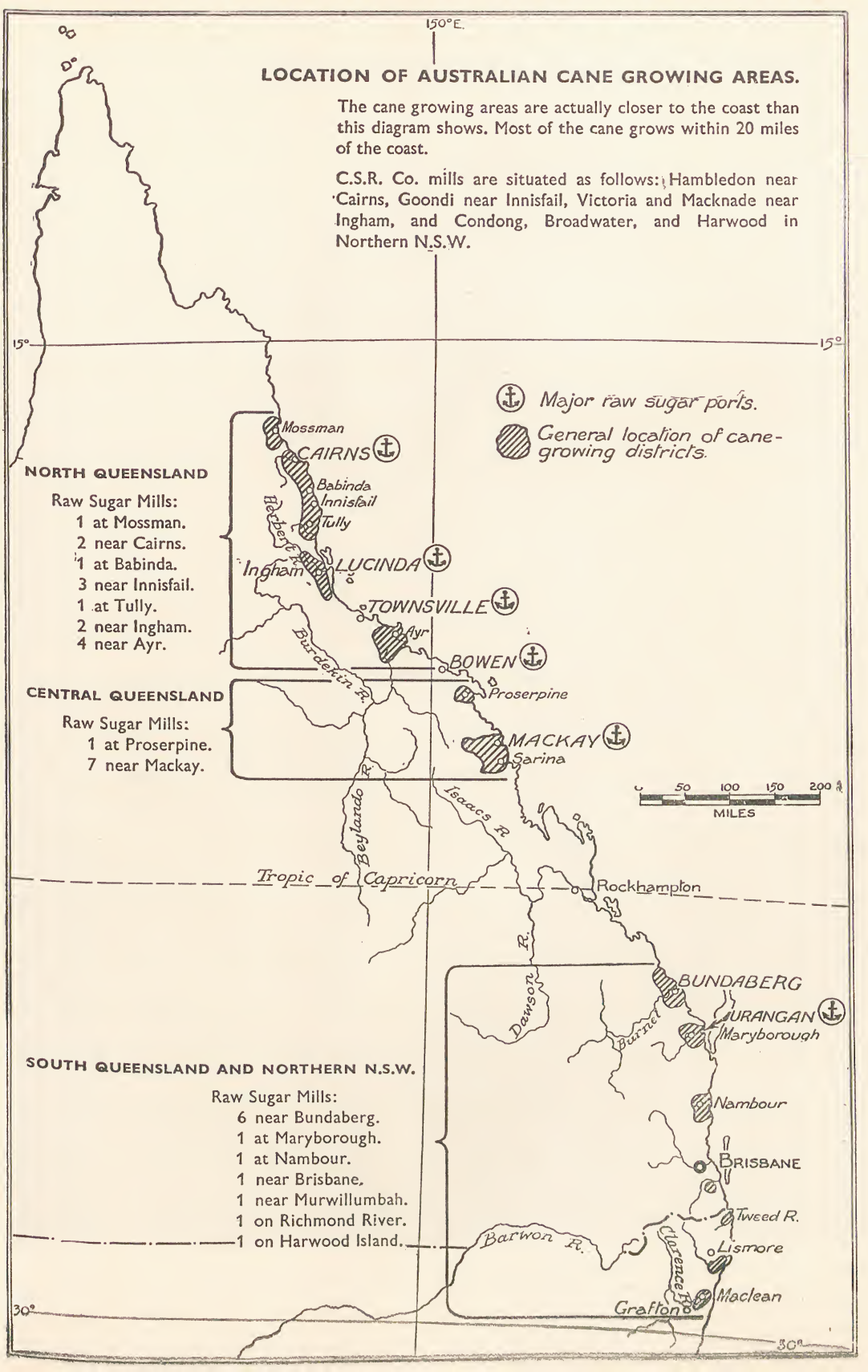
More immigrant cane cutters are being sought from overseas countries, particularly Italy, by a selection team of experienced cane farmers for the 1955 harvest. This will help, though some in the industry believe it is only a palliative—some of the migrants will drift away to easier jobs when the months of real heat arrive.

Mechanical cotton harvesting was achieved only after forty years of effort, and attempts to devise mechanical cane harvesters have been made for at least as long, but the problem is harder than it seems at first sight. Both Hawaii and Louisiana, the only places which have mechanical cane harvesting, were forced into it by labour shortages during World War II. The Hawaiian method, which is in fact more costly than hand harvesting was, depends on the use of huge machines which practically bulldoze the crop off the ground and load it by big grabs, which inevitably also collect considerable quantities of dirt, stones and cane roots. Mills are equipped with cane laundries and cleaners, expensive items using large volumes of water which incidentally washes away a good deal of sugar from any broken or crushed sticks.

This type of harvesting is used in Hawaii on large plantations and is unsuitable for the individual farms of Australia. Moreover, sugar millers here wish to avoid the cost and waste of cane laundries. The Fairymead Sugar Company at Bundaberg has a large plantation acreage of its own and has devised several mechanical harvesters. It cuts a portion of its cane mechanically and this is afterwards loaded by mechanical grabs. But its machines are still rather too big for the average cane farm, and it has had to install a cane laundry.

The harvesting problem seems to await a machine more in the lightweight tradition of the Australian agricultural implements industry. A good deal of effort is being made to devise such a machine, mainly by inventive cane farmers. But to produce a machine which is relatively simple and cheap and yet is capable of harvesting all types of cane, including tall and tangled and fallen crops, is really difficult.

The sugar industry was caught unprepared for the labour shortage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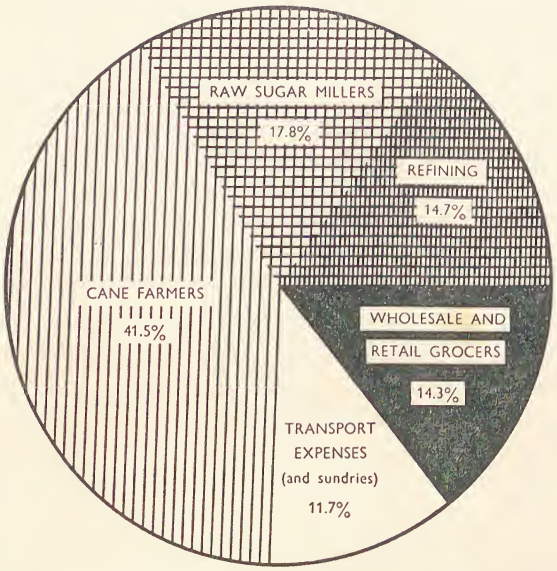
LOCATION OF AUSTRALIAN CANE GROWING AREAS.
The cane growing areas are actually closer to the coast than this diagram shows. Most of the cane grows within 20 miles of the coast.
C.S.R. Co. mills are situated as follows: Hambledon near Cairns, Goondi near Innisfail, Victoria and Macknade near Ingham, and Condong, Broadwater, and Harwood in Northern N.S.W.
15°
15°
Major raw sugar ports.
General location of cane-growing districts.
NORTH QUEENSLAND
Raw Sugar Mills:
1 at Mossman.
2 near Cairns.
1 at Babinda.
3 near Innisfail.
1 at Tully.
2 near Ingham.
4 near Ayr.
Mossman
CAIRNS
Babinda
Innisfail
Tully
Herbert R.
Ingham
LUCINDA
TOWNSVILLE
Ayr
Burdekin R.
BOWEN
CENTRAL QUEENSLAND
Raw Sugar Mills:
1 at Proserpine.
7 near Mackay.
Proserpine
MACKAY
Sarina
50 100 150 200
MILES
Isaacs R.
Beylando R.
Tropic of Capricorn
Rockhampton
Dawson R.
BUNDABERG
BURANGAN
Maryborough
Burnett
SOUTH QUEENSLAND AND NORTHERN N.S.W.
Raw Sugar Mills:
6 near Bundaberg.
1 at Maryborough.
1 at Nambour.
1 near Brisbane.
1 near Murwillumbah.
1 on Richmond River.
1 on Harwood Island.
Nambour
BRISBANE
Tweed R.
Barwon R.
Clarence R.
Lismore
Grafton
Maclean
30°
30°



DISTRIBUTION OF RETAIL PRICE OF REFINED SUGAR IN AUSTRALIA

The cost of assistance to fruit growers and processors is included in sundries. *Source: C.S.R. records for 1954 season.*

in the 1954 harvest. Migrants under a two-year bond had been sent to help with some of the big postwar crops and for a record crop in 1953 there was plenty of labour because of the Australian recession of 1952-53. But the even bigger crop of 1954 coincided with the return of overfull employment in Australia. Future crops may be smaller because of restrictions or less favourable seasons but there is no guarantee of an ample supply of cane cutters who will stay on the job for the whole season. It seems that mechanical harvesting must come if the Australian industry is to avoid chronic trouble in harvesting its crop.

Another major problem, which the industry is successfully tackling, is the bulk handling of raw sugar. This will reduce the heavy cost of transporting and handling raw sugar in 3-bushel jute bags. Not only are the bags expensive, though cheaper than a few years ago, but raw sugar in bags has to be man-handled into and out of mill stores, onto wharves and into ships' holds, out again and into refineries. Waterside workers are handling, per man per hour, only about half the prewar volume and strikes are more frequent and more costly.

C.S.R. investigations into bulk handling were started some six years ago and are now beginning to show results. Two of the company's three mills in New South Wales, Harwood on the Clarence and Broadwater on the Richmond, have been equipped for bulk sugar storage and bulk loading of ships. This was not so costly. But the company's bulk sugar installation at Pyrmont, Sydney, has cost £800,000. The

Farmer mechanically weeding and cultivating young cane near Cairns, northern Queensland.

Two typical cane farm scenes, northern Queensland. Young cane in foreground, mature crops in middle distance, Great Dividing Range in background.

Diesel locomotive hauling trucks of cane over the Herbert River to C.S.R.'s Victoria Mill, northern Queensland.

Newly installed high speed centrifugal machines, Victoria Mill.

C.S.R.'s Broadwater Mill on the Richmond River, New South Wales.

Raw sugar being loaded in bulk at C.S.R.'s Harwood Mill, Clarence River, N.S.W.

grabs of two great unloading gantries lift the raw sugar out of ships' holds at a very fast rate and deliver it to conveyor belts; it is weighed automatically and put into bulk storage sheds. The installation will amply pay for itself in lower handling costs, savings on bags, and very quick turn-round of ships. Two ships bulk-handling sugar between northern Queensland and Sydney would move nearly as much as three ships would carry in bags, so the cost of one ship or its equivalent in lower freight charges can be set off against the cost of bulk handling facilities.

There is much more work yet to be done before Australia is fully equipped to handle all its raw sugar in bulk, and it is work which will have to be done at present high construction costs. The general scheme is to store only a limited amount in bulk at each mill and to transport most of the raw sugar in bulk rail waggons or tram waggons to large bulk sheds at the port. From these sheds band conveyors will load ships in much less than half the time at present needed.

Work on a £1,200,000 project at Mackay Harbour has started and a similarly expensive project at Lucinda will commence in 1955, although these installations will not be operating before 1957 and 1958 respectively. Sugar mills, Harbour Boards, the Sugar Board, shipping companies and refineries are all affected by bulk handling. C.S.R. is planning the overall operation and the time schedule, and helps with much of the detailed work. Plans are being considered to convert three-quarters of the industry to bulk handling. It would cost about £8 million, excluding the expense of new or adapted ships, to convert all mills, ports and refineries to bulk handling, and maintenance and depreciation would be heavy items. The savings on bulk handling will not be great enough to allow a reduction in the Australian sugar price but they will help to offset several other increases in costs that are taking place.

An idea of the cost structure of the industry as a whole, from the Australian consumers' viewpoint, is given by the following table showing the break-down of the Australian retail price of 9*d* a lb. The returns to growers and millers from raw sugar which is exported are at present somewhat less than those shown.

It will be seen that growing and harvesting the cane is by far the biggest single item. By contrast, the mass production factory processes of raw sugar milling and of refining are relatively inexpensive although the syrups and sugar have to be handled many times in each process and some is unavoidably lost or turns into molasses. Refining, for instance, a complex process of re-dissolving the raw sugar, filtering, decolorizing, re-crystallizing, drying and bagging, costs less than the

grocer gets for putting the sugar into 2 lb. paper bags and pushing it across the counter. But the grocer's job means hand labour, and he loses a little in giving everyone full weight.

	Pence per lb. refined sugar
Farmers' share	*3.69*
Raw Sugar Millers' share	*1.66*
Raw Sugar Pool costs of transport etc. (mainly sea freight and raw sugar bags)	*0.94*
Refiners' (C.S.R. and Millaquin) operating costs excluding overheads	*0.98*
Payment to C.S.R. for managing, selling and financing raw and refined sugar, including overheads on refining and advertising, income taxes and profit margin	*0.36*
Assistance to Fruit Industry on home consumption and export market and assistance to other exporting manufacturers ...	*0.08*
Wholesale margin	*0.20*
Retail margin	*1.09*
Retail price:	*9.00d per lb.*

The item above—assistance to the fruit industry and to exporters—is an arrangement whereby exporters of canned fruit, confectionery and similar products get their sugar at the cheapest possible price: the home price or the price of imported refined sugar, whichever is lower. In addition, the fruit industry gets some assistance on the home consumption market. Thus the fruit industry does not lose by the existence of the Australian sugar industry.

Transport and distribution accounts for a surprisingly large part of the retail price of 9*d* a lb. If earth was obtained, free, from Queensland cane fields, taken via mills and refineries (without processing it in any way) and sold by the grocer in 2 lb. brown paper bags, he would have to charge at least 2½*d* per lb. for it.

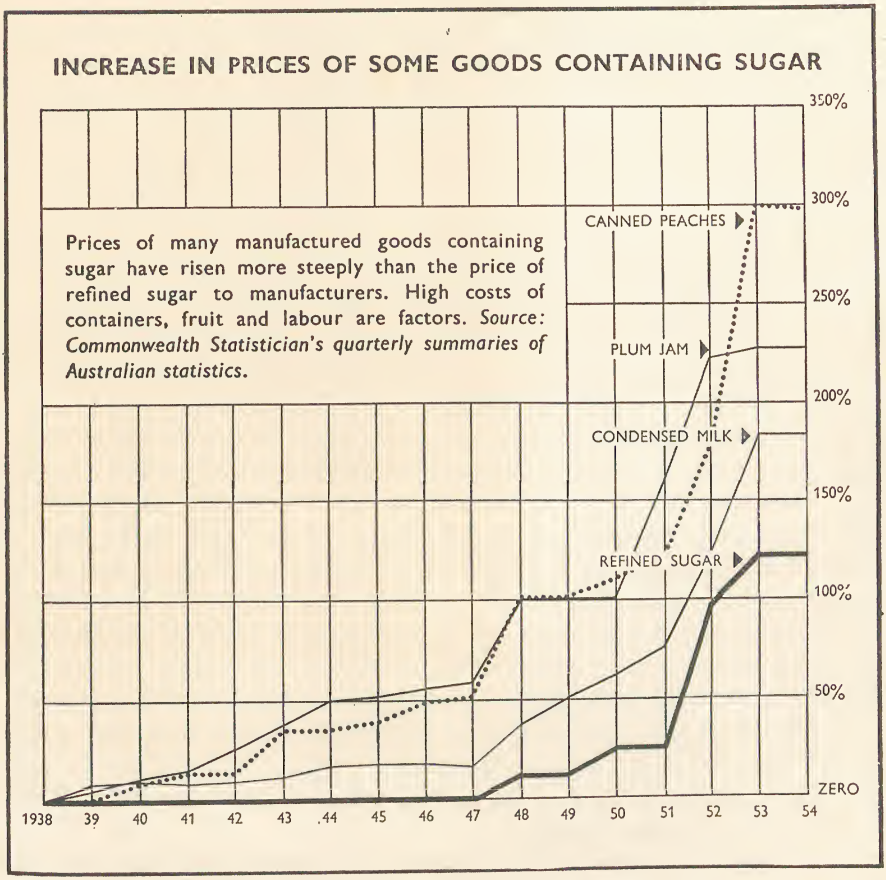
It is now worth looking at the Australian industry in some detail to see how it has built its high living standards in the domain of cane sugar, traditionally based on cheap labour. In its early years Australia relied on cheap labour, the Kanakas, and many plantation owners and farmers of the old days could not see how cane could possibly be grown here on any other basis.

It was a long struggle, with several setbacks, to remodel the industry

on white labour. In the process all but three of the plantations disappeared, and the successful system of individual working farmers owning their own land was established. C.S.R. gave an early lead in this by cutting up its own plantations. Moreover in the process of conversion many mills closed. In 1888 there were 106 Queensland sugar mills of which a dozen survive today, and of 36 New South Wales mills only 3 remain.

The progress that built the modern Australian sugar industry, that more than doubled the yield of sugar per acre between 1900 and now, and that enabled one present mill to make more sugar than all the 142 old-timers made, is the progress of increasing scientific knowledge, skill and capital equipment vigorously applied to an industry that sorely needed it.

C.S.R. pioneered scientific and technical improvement in its own



sugar mills and refineries and had earlier worked on crop improvement. A scientific paper read by the then general manager, E. W. Knox, in 1890, reads as though it might have been written in the last ten years. C.S.R. men evolved methods of chemical control in milling, known as "chemical book-keeping", by which the sugar received in the cane at the mill is all to be accounted for—made into raw sugar or lost in the molasses, in filter mud, and in megass (fibre); also a formula by which the efficiency of milling may be measured: these methods are still in use, with improvements and refinements, in all mills today. The system of paying farmers according to the sugar content of their cane as well as its weight, also pioneered by the company, has led to a great improvement in the quality of cane grown.

The interest of the mills in the success of the farmers is profound. Every modern mill with its transport system represents enormously expensive capital equipment and buildings—worth from £3 to £4 million if built today. The fixed charges of interest, depreciation and maintenance, almost irrespective of how much cane is crushed, amount to nearly half of a mill's annual costs. Only by making as much sugar as it can, up to its allowable maximum, can a mill get into a good financial position. To keep up cane yields per acre during adverse seasons, particularly during the partial droughts that are common in most Australian cane areas, needs really good farming, and mills try to encourage this. It also needs good farmers and good farm managers to keep the cane coming into the mill without interruption during crushing, farmers who will co-operate with the mill's officials (the cane inspectors) who have to organize the cane transport system, and farmers who can get the best out of the cane cutting gangs.

At the same time the farmers have a big stake in the success of their mill, even when it is not a co-operative paying them bonuses. Apart from bonuses paid to the farmer-millowner, a successful co-operative mill becomes a well-equipped mill, one that can crush at high rate without breakdowns, so shortening the crushing season into the mid-season months when the cane contains most sugar. A chronically unsuccessful mill has to close down, and some or most of the farmers lose their valuable cane assignments unless they are within reasonable distance of another mill. Even as recently as 1951 a mill in southern Queensland closed, and several of the smaller mills now operating would have been in a very precarious position but for the recent expansion of cane areas and the good seasons, which have given them a bigger throughput of cane.

In essence the sugar milling process is simple—crush the cane to extract the juice and boil off the water to get the raw sugar. The

complications, and there are many, arise from a multitude of technical improvements that have been added to carry out this process more and more efficiently and economically. A very great deal has been learnt about sugar milling in the past eighty years and Australia has been in the front rank of this progress, and still is, as the opinions of overseas mill technologists testify. There is progress yet to be made; on the other hand, the standard of milling is now very high and it is easy to slip back by bad mill management or by lack of the best plant or by poor technical staffs, as a few mills have found out in recent seasons. Like Alice and the Red Queen, the sugar mills have to run pretty hard just to stay where they are.

Much of the further progress now depends on the replacement of old plant with improved, highly efficient and labour-saving new plant, but it is enormously expensive. Nevertheless it often pays, but a number of mills have recently spent so much on new plant that they have run out of money and gone into heavy overdrafts.

Some elaboration is necessary of the idea that sugar milling is merely crushing the cane and boiling off the water. Crushing is a process of brute force that literally shakes the foundations of the mill and the earth around it. For all that, it is finely controlled and adjusted, with the great rollers correctly set within a thirty-second of an inch and the steam engines that drive them accurately matched against their varying loads. Basically, crushing is putting the cane through a series of giant steel wringers. Each mill has three rollers 5 ft. to 7 ft. long and about 3 ft. in diameter, one top roller meshing with the two below so that the cane is squeezed twice in each mill.

Between each set of mills the cane fibre is washed and stirred in dilute juice and at later stages in hot water to soak out as much sugar as possible, nicely balancing the amount of water added, because it has to be boiled away later, with the value of extra sugar recovered by adding the water.

The cane fibre coming from the final mill (bagasse or megass) is damp-dry. About 50 per cent of the weight of the megass is water and this contains about 4 per cent of the sugar originally in the cane and paid for by the mill. This is an appreciable item of expense and is one of the many figures closely watched by the mill staff. Even though the fibre is so damp it burns well in specially designed furnaces and, as luck has it, provides just about the right amount of steam and power which the mill requires to do all its work—driving steam engines, generating electric power for motors and lights, and providing steam for the boiling process, which also uses exhaust steam from the engines. Early in the season, when the fibre content of the cane is low, mills

have to buy firewood or coal to help keep the boilers fired. To reduce this expense they have to give great attention to efficient combustion and efficient use of steam.

The juice that leaves the crushing rollers is dirty and to remove many of the impurities it is treated with lime, heated, and allowed to settle. The mud that settles is filtered and washed to recover sugar and is then given to farmers as a fertilizer. The clear filtered juice contains about 14 per cent sugar and the water has to be boiled away until it becomes a syrup containing about 70 per cent sugar. This is done in a series of evaporators, the steam boiled off the first "pot" being used to heat the second and so on, with each succeeding pot kept under a lower pressure and therefore boiling at a lower temperature. In this way one pound of steam will evaporate as much as five pounds of water.

The syrup is dark, because of molasses in it, and is now dense enough for the final boiling under reduced pressure to prevent charring of the sugar. As more of the water boils off, the raw sugar crystals form. Crystallizing the sugar is carefully controlled by electrical and other devices and by adding more syrup so as to get correctly-sized sugar crystals and yet prevent the whole pan setting solid.

To separate the sugar crystals from the molasses, which still contains sugar, the mixture is spun in centrifugals (fugals) with finely perforated baskets through which the molasses drains. As much high grade sugar as possible is made and this after drying becomes raw sugar, looking rather like brownish table sugar. After repeated boilings the molasses syrup will only yield low grade sugar which is used to start the crystallizing of higher grades. Residual molasses contains an obstinate 7 per cent of the original sugar which came in the cane plus fruit sugar and minerals, and is used in distilleries or for fertilizer or for stock food. It is not economic to recover the sugar in the residual molasses.

Great advances have been made in recent years in the design of fugals, which are imported. One Queensland mill installed five large automatic fugals at an extra cost, compared with the older type, of some £35,000 but they save about £4,000 a year in wages besides giving better control by automatic timing of the spinning and automatic washing of the sugar. This is an investment that pays, though not with a large margin.

This problem is typical. Many of the older items of plant in the mills, and in refineries too, while often lacking something in efficiency compared with the latest available new plant, are in fact the best-earning investments considering their low original cost. The depreciation allowed by the Commissioner of Taxation will never suffice to

replace them. Replacement has to be provided out of heavily-taxed recent profits or from new capital or borrowings. Hence many mills present a strange and uncompleted hotch-potch of the old and the new. Sugar engineers could build a gleaming new mill but it probably would not pay. The skill of management during the period of expansion and inflation has been to make the replacements and enlargements which are most efficient and profitable for their cost, to harness old and new together and make the partnership work, to do as much of it as possible with the mill's own staff during the slack season, and finally to be prepared to switch back if items of new plant fail to arrive on time.

Sugar milling is a mass production industrial process, but it deals with an organic substance that is highly variable in composition. Chemists had to devise the modern process of sugar milling and its control and they are still improving it, assisted by engineers on the mechanical and power side.

The industry is doing much research into its mill problems through several organizations. C.S.R. has a large part of its big Sydney research organization working on mill problems. Being a centrally controlled company with seven mills in Australia and five in Fiji it can apply the results widely and quickly. Technical inspectors closely check the operating results of all C.S.R. mills, and they are in a position to supply expert technical assistance to mills in difficulties.

The other chief mill research organizations are the Queensland Government's Bureau of Sugar Experiment Stations (Mill Technology Section) and Sugar Research Limited, an organization set up in 1949 and supported entirely by the sugar mills of Queensland because they felt the need of more basic research into milling. In addition the industry pays all but £7,000 a year of the cost of the government Bureau. In relation to the size of the industry the extent of research into sugar is a record for Australia and it is paid for almost entirely by the industry itself. A Mill Research Programme Committee of senior technologists prevents overlapping in research work. There is also a great deal of international exchange of information in sugar technology.

Research on cane-growing is carried out by both the Bureau of Sugar Experiment Stations and C.S.R., and both have scored notable successes in more than fifty years of effort. The Government's Bureau provides a very comprehensive service to all cane areas in Queensland. C.S.R. grows no cane in Australia but develops new cane varieties and provides other agricultural services free to the farmers, in addition to meeting its share of the expenses of the Bureau.

Although some canes flower but shyly in the Queensland climate, the seedheads, or "arrows", give fertile seed and can be crossbred to yield an immense variety of canes. At present the Bureau and C.S.R. together have growing annually about 60,000 seedlings, which in eight or ten years may produce six good new commercial canes of which perhaps one or two will be outstanding. A new variety must yield well, be rich in sugar, be resistant to at least half a dozen diseases, and be able to ratoon well, that is, to throw up strong shoots from the root stock to provide crops in the second and third years without replanting. A new variety should not fall over easily and its suitability for mechanical harvesting may be a principal requirement in the future. For New South Wales and southern Queensland it should have some frost resistance and for all areas some drought resistance. Both C.S.R. and the Bureau have bred some outstanding canes and 80 per cent of canes now grown in Australia are of C.S.R. and Bureau varieties.

The early Australian cane growers imported dozens of cane varieties and with them practically every known cane disease and pest, and there are many. Australia became the place for scientists to visitfor the study of cane diseases, and it has taken years of effort by Australian scientists, field workers, farmers and pest boards to clean out the diseases. A notable recent victory was the use of B.H.C. (*benzine hexachloride*) insecticide to control several types of beetles and grubs that previously destroyed whole crops. So effective was it in providing increased yields, even in some places where damage from these pests was not suspected, that some Italian farmers could hardly be convinced that this insecticide was not a fertilizer.

Two other major subjects of cane-growing research and experiment are fertilizers and cultivation methods. An average cane crop yielding twenty to twenty-five tons of cane per acre, plus another ten to fifteen tons (green weight) of tops and leaves, and with a big root system, naturally draws heavily on soil fertility. Six to ten hundredweight of mixed fertilizers are used per acre, the mixture depending on the class of soil, which varies greatly, and on the results of many soil analyses and experiments. Green manure crops are used to add nitrogen and improve the soil when the land is rested from cane before replanting.

In Australia, but in only a few other cane countries, cane fields are nearly always burnt before harvesting. Small blocks, of an area which can be cut in two days, are set on fire and the trash burns fiercely, but this does not greatly harm the cane if it is cut and milled promptly. It makes cane cutting easier, kills a lot of pests, and prevents the itches that attack cutters in "green" cane. Burnt cane does cause difficulties in the mill, however, and a slightly lower price is paid for it.

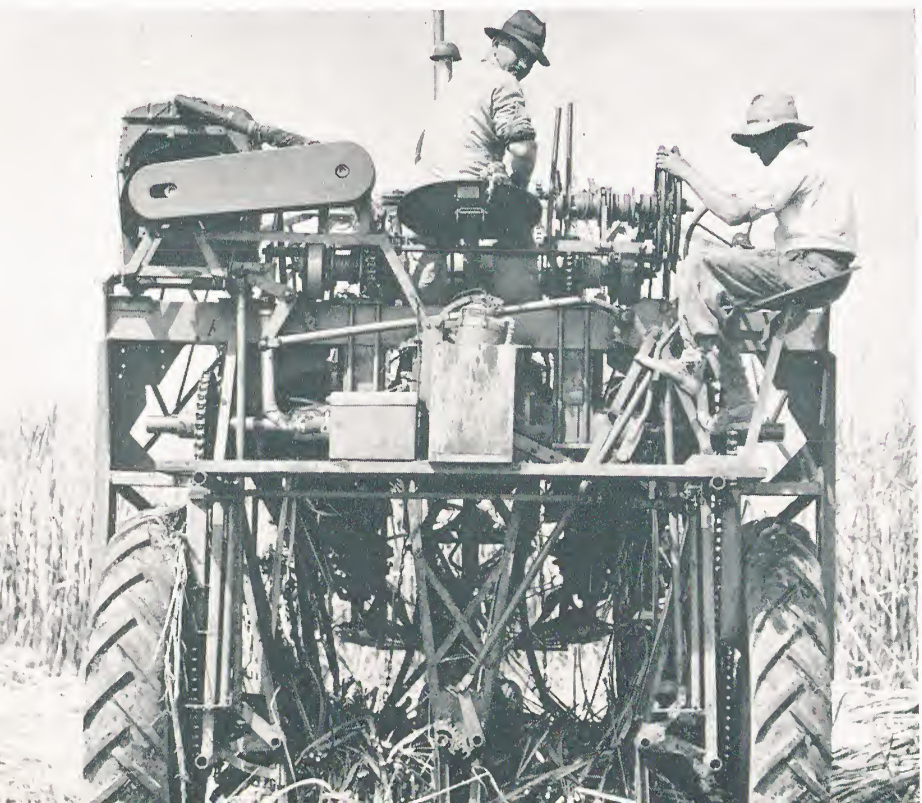
Cane farms, Tweed River Valley, northern New South Wales. Mount Warning in background.

This double row planting machine cuts "seed" cane into one-foot lengths, drops the short pieces of cane into the furrows with fertilizer, and covers in the furrows as it moves along.

Ploughing-in Gambia Pea. Leguminous crops are grown in a two-crop rotation with cane. They are not harvested or fed to stock, but ploughed in to improve the structure of the soil and enrich it.

Australian cane cutters, working by contract, cut and load 6 to 8 tons of cane per man per day, average over the whole season—twice or three times as much as cutters in other cane industries.

A cane harvesting machine developed by the Fairymead Sugar Company, Bundaberg. Many machines have been experimented with but none has so far been developed to suit all areas and conditions.



Photograph of cane cutters by courtesy of Queensland Bureau of Sugar Experiment Stations.

Cane fields south of Cairns. The belt of cane country which stretches from Cairns south to Tully is the largest continuous area devoted to cane in Australia. It is nearly 100 miles long and a mile to fifteen miles wide. The main dividing range flanks the belt on the west and lesser ranges separate it from the coast. Much of this area consists of a trough between the ranges which has been partly filled in by depositions of soil scoured from the steep ranges by high rainfall. A number of river valleys cross this belt, which is protected to some extent by the coastal ranges from the cooling effect of sea breezes. The area enjoys, in a high degree, the primary conditions for cane growing —rich soil, high rainfall and high temperatures.

The main north-south road and railway run past the homes in the foreground. Other farm homesteads can be picked out where the timbered foothills meet the cane fields.

Three generations of a cane farming family

The Ferrandos are typical of many farming families of Italian extraction in the Herbert River district. Immigrants of Italian stock and their descendants have proved themselves industrious and efficient farmers and good Australian citizens.

Annibale Ferrando, the grandfather, was born at Conzano, northern Italy, in 1874, and followed the trade of bricklayer. He migrated to Australia in 1912, coming direct to the Herbert River district, and commenced work as a cane cutter. Over a period of seven years he saved sufficient wages to purchase a small farm in partnership with a fellow cutter. This farm was situated in the Macknade Mill area.

He became naturalized in 1920, and in 1922 disposed of his share in the Macknade farm, and purchased his present farm in the adjoining Victoria Mill area.

At the time of purchase the farm produced some 600 tons of cane, but at the present time approximately 3,000 tons are harvested annually. This increase called for much hard work clearing many acres of heavily-timbered land, mainly by primitive methods compared with the modern methods of using bulldozers.

In the early twenties he lived in a bark humpy with grass thatched roof, bringing up a family of three boys and two girls in rather primitive conditions. As success came his way he built a modern home and now lives in comfortable surroundings. His three sons, Giuseppe, Luigi and Vincenzo, have worked on the farm continuously. Two of them are married with a family and occupy their own homes.

The father retired in 1951, but still takes an active part in the organization of the farm. He performs many jobs of maintenance around the place, and is keenly interested in his six grandchildren.

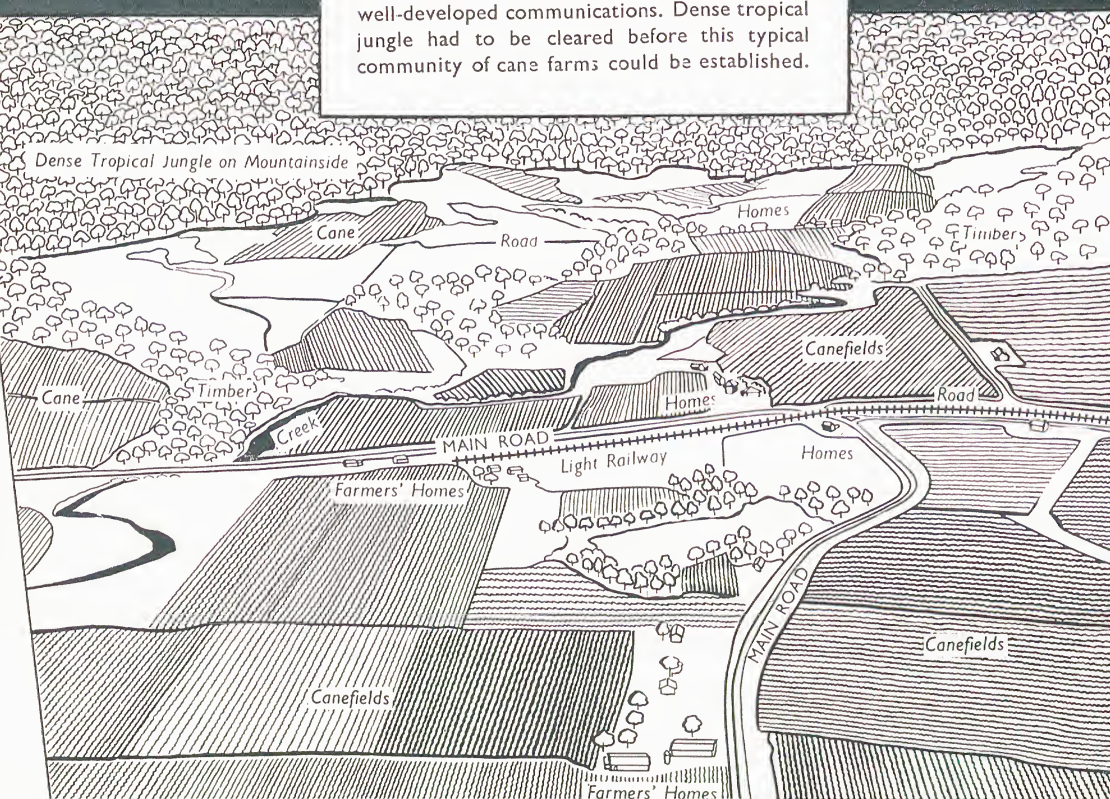
A newly opened-up farm in the Innisfail district, North Queensland. The farmer has planted his first crop of cane between the stumps and heaps of fallen trees. The small plants do not show up in the photograph.

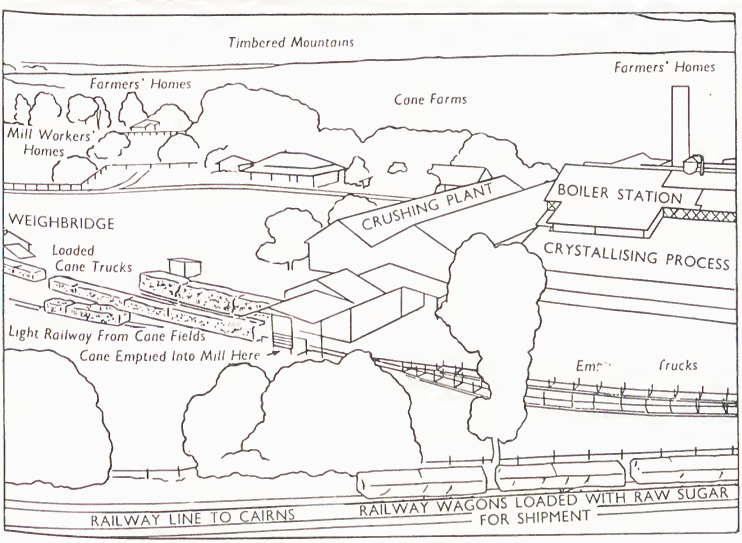
Young soldier settler cane farmers in the Abergowrie district, on the Herbert River, North Queensland.

Cane farmer's wife and child, garden and farm, Ingham, North Queensland.

Home of established cane farmer, Cairns, North Queensland.

Cane farms near Cairns, North Queensland. The cane growing districts are closely settled, with well-developed communications. Dense tropical jungle had to be cleared before this typical community of cane farms could be established.





Mulgrave Mill, near Cairns, North Queensland. Mulgrave is one of 14 Australian raw sugar mills which are co-operatively owned by the farmers who supply them with cane.

Harvested cane is weighed at the mill, shredded into small pieces, and the juice crushed out by large iron rollers. The juice from each batch of cane is analysed and the farmer is paid according to its sugar content.

The fibre of the cane is used as fuel for the mill furnaces. Lime is added to the juice to precipitate impurities; the juice is filtered, concentrated by evaporation, and boiled under vacuum until crystals of raw sugar form. The crystals are separated from the syrup, dried, packed and sent to the nearby ports for shipment to refineries.

Laying a new light railway line to bring harvested cane from the recently opened-up Abergowrie district on the Herbert River, North Queensland.

Constructing new boiler station at Goondi Mill near Innisfail, North Queensland.

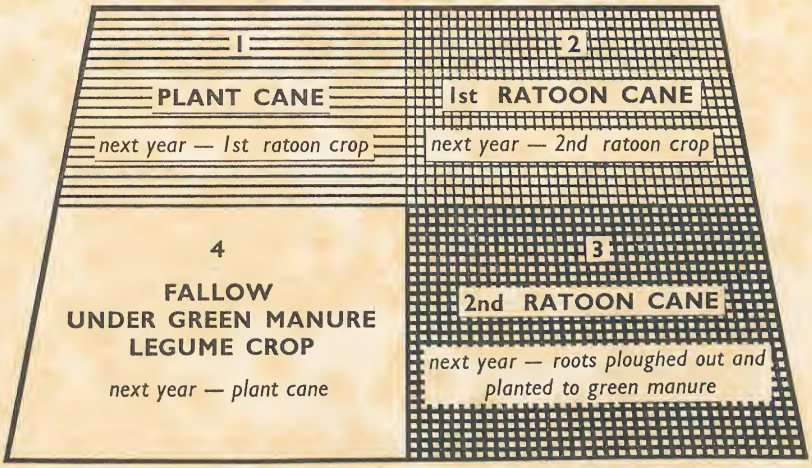
Installing new high speed centrifugal machines at Goondi Mill.

Cairns owes much of its development to the sugar industry.

Mackay is one of the modern cities which the sugar industry has helped to develop in tropical Australia.

It seems wasteful to burn all this organic matter but, in a twenty-year experiment at the Bundaberg field station, areas where trash was regularly conserved and ploughed in showed no better yield than that of a burnt plot. One factor is that the cane's big root system itself adds much organic matter to the soil. An interesting cultivation experiment at Mackay, where cane soils are mostly shallow overlying clay, is deep subsoiling and allowing megass to trickle down the cracks to help keep them open and aerate the subsoil. Results so far are promising.

The skill of the scientist and the farmer plus the luck of the seasons can easily produce a bankrupting abundance of sugar as it did in the 1930s. One can scarcely blame the world sugar industry and the Australian industry for trying to organize themselves to prevent disastrous gluts. Consumers would have just cause for complaint if they were held to ransom by high prices for sugar with big profits and soft conditions inside the industry, because of its government-ordained monopoly position. Is this so in Australia? The short answer is—No. The long answer is given in the report of a 1952 Commonwealth committee of inquiry. After a full investigation of the efficiency of the industry the price it recommended included a modest return on the capital of farmers, millers and refiners, varying between 5 and 10 per cent on various types of assets. It allowed the farmer, in addition,



4-YEAR CROPPING CYCLE, TYPICAL AUSTRALIAN CANE FARM

In Australia it is usual to harvest three crops of cane from the one plant. A new crop which grows from the stumps of harvested cane is called a ratoon crop. Leguminous cover crops are grown and ploughed into the soil to maintain its humus content and to provide nitrogen.

an annual wage at award rates plus about £250 a year for managerial skill and work. Sugar is a low profit margin industry right through from grower to grocer.

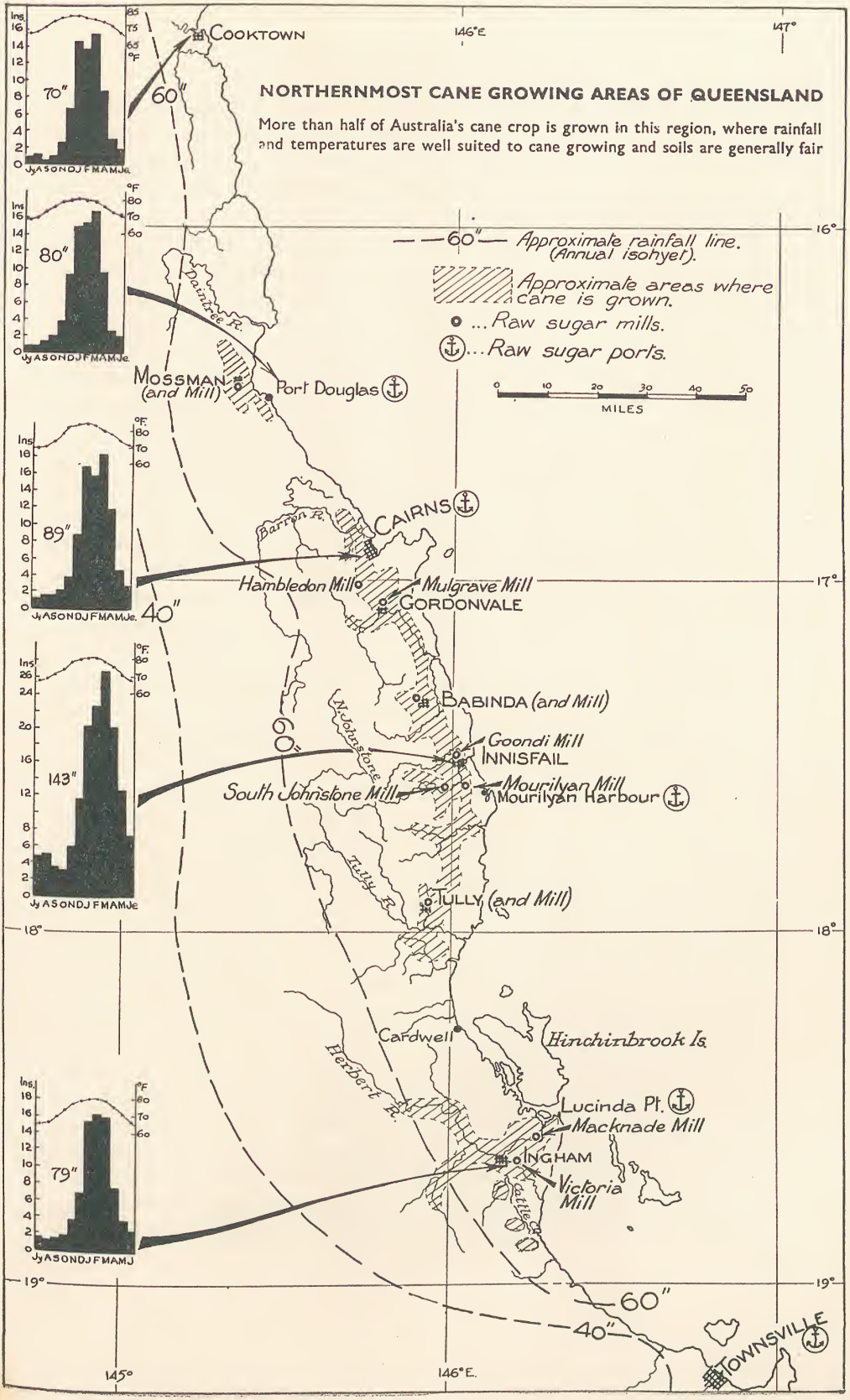
C.S.R., which mills some of the sugar, buys the industry's bags, acts as agent to sell all raw sugar, finances the mills and through them the growers pending sales, and refines nearly all Australian requirements, is under the closest official scrutiny. Prime Minister Hughes said during World War I, "Now I have C.S.R. in the shafts, all I have to do is hold the reins." C.S.R. has been a willing horse and has received a strict ration of feed.

Its success has not been mainly due to its so-called "monopoly" position, which is in fact a collection of controlled-margin jobs that nobody else wants. These have been bread-and-butter work but provided a base which allowed the company to grow in size. Size helps its other activities, its staff is more expert, its policy decisions often better. It can use its financial resources, its capital equipment and skilled personnel to better advantage than can smaller businesses. By this type of management efficiency C.S.R. prospers.

What about the efficiency of the farmers? They vary greatly, of of course, like any other farmers. The good farmer on his own land has to keep himself abreast of the latest developments—cane varieties, cultivation methods, disease control, tractors and implements. His sixty to seventy acre farm, growing forty-five acres of cane for annual harvest, keeps him busy most of the year with the sequence of planting, cultivating (until the cane gets "out of hand"), harvesting, cultivating and fertilizing ratoons, fallowing and green manure cropping. His farming is more of the intensive style like potato-growing rather than wheat farming.

The cane farmer's slackest time is during the "wet" when there is little he can do but sit on the verandah and watch the cane grow in the rain. The repair of implements and tractors will, however, become a more important slack season job as his machinery gets older. The established cane farmer has rather less spare time than the established Australian wheat farmer. Compared with wheat farming the cane farmer is much less likely either to make a fortune or to be ruined by drought. Cane yields vary within a narrower range. Unavoidable expenses, including cane cutting, are fairly high.

The "soldier settler" cane farmers are mostly making good. To get the heavy timber bulldozed off their blocks and burnt cost them £40 to £80 per acre, depending on whether they had open eucalypt forest or "scrub"—the tropical jungle where to remove a single huge tree can cost £100. With a simple house, shed, tractor, implements and


NORTHERNMOST CANE GROWING AREAS OF QUEENSLAND
More than half of Australia's cane crop is grown in this region, where rainfall and temperatures are well suited to cane growing and soils are generally fair
70"
80"
89"
143"
79"
60"
40"
60" — Approximate rainfall line. (Annual isohyet).
Approximate areas where cane is grown.
... Raw sugar mills.
... Raw sugar ports.
0 10 20 30 40 50
MILES
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J
Cooktown
146°E
147°
Daintree R.
Mossman (and Mill)
Port Douglas
Barron R.
CAIRNS
Hambledon Mill
Mulgrave Mill
GORDONVALE
N. Johnstone R.
BABINDA (and Mill)
Goondi Mill
INNISFAIL
South Johnstone Mill
Mourilyan Mill
Mourilyan Harbour
Tully R.
TULLY (and Mill)
Cardwell
Hinchinbrook Is.
Herbert R.
Lucinda Pt.
Macknade Mill
INGHAM
Victoria Mill
Cattle R.
TOWNSVILLE
16°
17°
18°
19°
145°
146°E.

working capital, they incurred debts of £10,000 and over which will take capable hardworking men about 15 years to pay off, with average seasons and no undue restrictions on production—not too bad if they are young, strong, and reasonably intelligent and if they can remain healthy.

There are, of course, a few poor farmers, even among the soldier settlers. Such men are often those who "spend too much time in town". Their farms become overrun with weeds and grass, their crops are light. A poor farmer can exist in cane-growing if he has inherited a valuable property debt-free, but otherwise he cannot last long.

Cane farming has for many years rather been held in a straight-jacket by the system of cane "assignments" designed to prevent over-production. A farmer may grow only a fixed acreage of cane and, officially, this has to be grown on a certain portion of his land, even though he has spare land. Most mills hold detailed survey maps showing these areas on each farm. Each mill can be limited to a "peak" tonnage of raw sugar and, to enforce this equitably, each farm can, if necessary, be limited to a peak tonnage of cane. Such a necessity has arisen this year and restrictions are being applied. The Central Cane Prices Board, which finally adjudicates on these matters, has in recent years increased the assignments of many farmers whose assignments were too small. But some farmers with rather small areas cannot expand; they are using all their farms for cane and are hemmed in by other farmers doing the same, or by hills, rivers or swamps. In the northern Queensland cane areas particularly, i.e., from Mackay northwards, where 80 per cent of Australian sugar is grown, cane is almost the only form of farming. This has some disadvantages: no supplementary source of income, no livestock to increase soil fertility, and perhaps a tendency to the single-track mind. But there are some advantages, such as greater concentration on the main job of cane-growing and denser cane areas reducing the very important costs of cane transport.

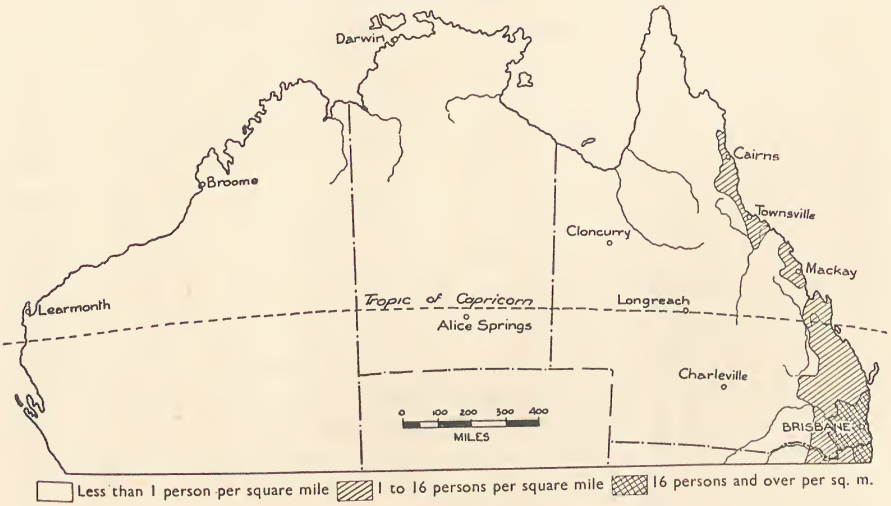
Beef cattle on improved pastures would fit in with cane-growing better than would dairying, which takes too much daily time during rush periods. Beef cattle may come gradually in the fairly rare cases where farmers have enough spare land to carry, say, a hundred head and make a proper business of pasture improvement and stock raising. Preferably they should be allowed to rotate their cane around the farm to get the benefit of soil fertility, though this immediately increases cane transport costs. In the denser cane areas nothing short of a complete re-design of assignments and transfer of farm ownership on a grand scale would release enough land for livestock farming.

Sugar land sells at £100 to £150 per acre of "gross assignment",

i.e., the total area on which the farmer is allowed to grow cane, and on about three-quarters of which he harvests cane each year. (Sometimes quoted prices are much higher than this but include tractors and implements and a standing crop which may be worth up to £100 per acre.) Cane land prices are, therefore, comparable with other intensive-crop land or good dairy land in districts which supply city demands for milk. There is no doubt that the granting of assignments does give the land great value compared with adjacent non-assigned land of the same quality. This is particularly so in northern Queensland where there is not much other intensive use for the land. The Cane Prices Board has to approve all sales and transfers of cane farms and, although the equivalent of "key money" sometimes goes into a sale, the influence of the Board in putting a brake on values and the modest margin of profit in cane farming have prevented the great increase in land values compared with prewar that has occurred in most other farming and grazing.

The cane districts and cane towns are now solid and prosperous, but not blatantly so. Most cane farmers have had several good seasons and have been conservative with their money, saving a good deal of it. They tend to spend first on new and improved tractors and farm equipment, then on motor cars or on their houses. Except on the older-established farms the standard of housing is usually not high.

NORTHERN AUSTRALIA—POPULATION DENSITY



Tropical Australia is sparsely inhabited except for those districts on the eastern coast of Queensland where cane is grown.

In northern Queensland the more recently-settled Italian farmers are not accustomed to good housing and spend reluctantly on their houses and on their wives. Their Australian-born children, however, are growing up almost indistinguishable in outlook and idiom from other Australian children, except for their ability to speak Italian.

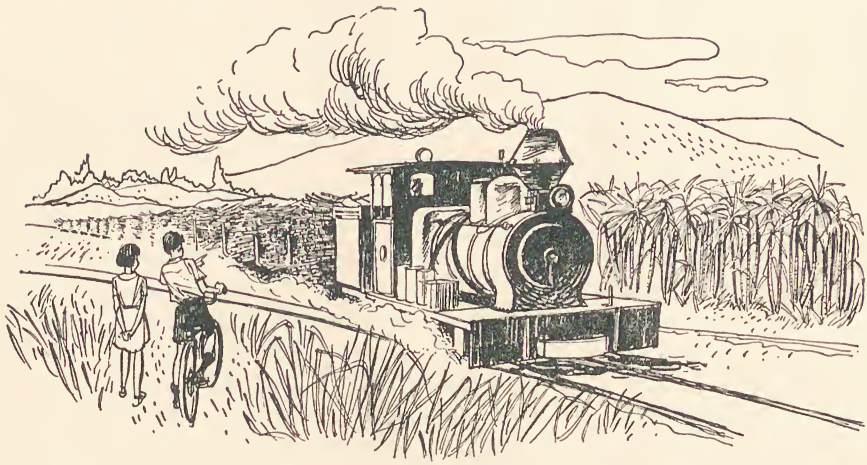
The towns and cities of the cane fields are very like towns of the same size anywhere else in Australia, with their chain stores, milk bars, hotels and good-class shops. Many of them are well laid out and well kept, and are justifiably proud of themselves. Mackay, with 15,000 people, is wholly a sugar city; Bundaberg with 20,000 and Cairns with 21,000 are largely built on sugar. Innisfail with a population of 6,600 is a prosperous town in the "wet" belt and Ayr (7,000) is the chief town of the important Burdekin delta cane area, a drier district where some 40,000 acres of high-yielding cane are irrigated by pumping water from underground sands.

The Australian sugar industry is a peculiar mixture of competition and co-operation, and this is a main reason for its progress and relative efficiency. Consider sugar sold in Australia: its price as refined sugar is fixed from time to time by agreement between the Commonwealth and Queensland governments. It then becomes the concern of each of the three main sections of the industry, growers, millers and refiners, to see that neither of the other two is getting more than its fair share out of it. The growers and millers and their organizations (and the Queensland Sugar Board) watch the refiner closely to see that he does not allow his costs to be inflated by internal inefficiencies or make undue profits which, if taken into account in the official split-up of the price, would reduce their own shares. Yet they must allow the refiner sufficient profit margin to enable him to install improved equipment and thus keep costs down. The millers watch the growers and the growers watch the millers, for each year the Central Cane Prices Board, with a Supreme Court Judge as chairman, determines how the raw sugar price shall be split up between them. It collects its own samples of costs and listens to arguments on increased items of cost by counsel for each side. Mills operate on a fixed price per ton of raw sugar for each season and hence compete to get their own costs down and output up. Co-operative mills have a foot in each camp, but their boards and managements have to protect the long-term interests of the mill against growers who want too much of the profit handed back to them as bonuses, so starving the mill of better equipment.

Yet growers, millers and refiners co-operate on many occasions. They worked hard together to get the best possible market for export

sugar. They are all interested in producing sugar of good quality, both refined and raw. In the 1954 season C.S.R. was concerned over export sales of raw sugar which overseas refineries found hard to filter. The company arranged for every Australian mill to send twice a week by air to its research laboratory samples of the raw sugar being produced to find out the causes of poor filterability and this research work is still in progress. All three sections of the industry are vitally interested, too, in bulk handling which will lower costs.

Sugar men in each generation have had to overcome new problems. They had to replace the Kanakas with independent farmers, and the multitude of small mills with large efficient mills. Later they expanded too much and had to impose a rigid method of limiting production. They have virtually wiped out cane diseases, bred better canes, mechanized cultivation, and doubled the yield of sugar per acre. Now, with markets better organized, they have expanded again, re-equipped their mills and farms, but have run into vicious problems of costs and labour shortages. Today's sugar men are not short on energy or ability. By research, technical improvements and good management they are attempting to solve these problems and to keep Australia in the forefront of world sugar.



CHAPTER 6

Sugar Milling by C.S.R.

J. M. DIXON

Having given a general picture of the sugar industry in the South Pacific we now come to more detailed descriptions of C.S.R. activities in it. The milling operations of C.S.R. in Australia and Fiji constitute one of its major activities. The company has been in milling for over eighty years so that a description of its methods and organization in this sphere reveals a good deal about its policies and traditions.

As Fiji has been considered specially in Chapter 4, this chapter deals more with the company's Australian mills than with those in Fiji, especially in relation to the field side. A number of matters referred to in Chapter 5, dealing with the Australian sugar industry as a whole, are covered here in more detail.

September 1955

A RAW sugar mill is a giant-sized and complex tool for breaking up sugar cane stalks, squeezing out their sweet juice, and recovering the sucrose as crystals of "raw sugar". In simplest terms, the task of the mill is to get rid of the bulky container, the fibrous and watery cane stalk, in which nature has produced sugar and to convert this sugar into an intermediate product which is reasonably stable and will keep well enough while it is stored and shipped to the refineries. That intermediate product is raw sugar, containing about 98 per cent sucrose.

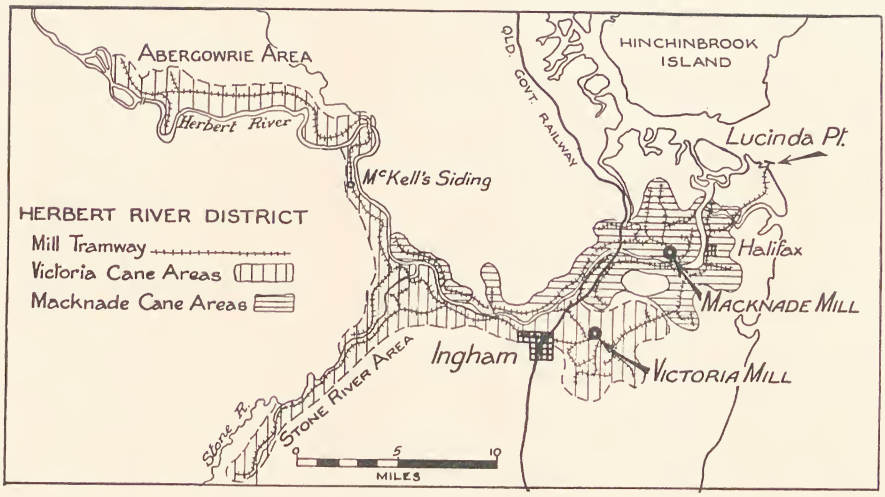
The technology of the process is deeply involved with the chemical nature of sucrose, which is particularly subject to losses when diluted, as in cane juice and in many of the stages of milling and refining. Acid conditions, excess heat, enzymes, bacteria and similar "wogs" are its chief enemies. Even in the crystallized raws losses still result if dampness occurs in warm conditions. In tropical climates the deteriorating organisms, which are air-borne and omnipresent, can breed in sugar as quickly as bacilli in the human system. Such losses are less in the cooler, drier, temperate zones where the refineries are situated and the main body of consumers live.

Marketing of the raw sugar is fully described elsewhere in this book; in the company, sugar marketing has its own organization separate from milling. The latter functions through two divisions: Australia, with seven mills, and Fiji, with five mills.

The regional location of sugar mills is determined by those geographical factors, soil, climate and terrain, which define the areas where cane can be grown successfully. Mills must have large continuous supplies of cane and cane growers must have a mill nearby. Cane is too bulky, heavy and perishable to transport over great distances, although moderate distances are practicable if the transport method is quick, cheap and sure.

The transport system is therefore the link between grower and miller, largely determining, within a given area, just where cane will be grown. Both growers and millers are vitally dependent on a good transport system and, in C.S.R. areas and many others in the South Pacific, it is the miller who supplies most of it. For a typical medium to big mill the permanent way, bridges, locomotives and trucks would cost today over £1 million. This feature of sugar milling is one which distinguishes it from other large-scale manufacturing enterprises. And sugar milling has other distinctive features.

Most factories, including sugar refineries, work to a planned level of weekly output conditioned by the sales budget, and this level is often less than full capacity. It is not so with a sugar mill: sales may determine



the mill's total production for a season, but, once started, the mill is "flat out" until the crop is finished, storing what sugar it cannot ship. This fundamental concept is accepted by everyone in and around the mills and farms, and imparts a very striking atmosphere to cane districts during the "crush". It is a basic characteristic of the cane plant which creates this situation. The sugar content of the cane is rising in June and July, reaches a peak in October and then begins to decline. The whole design and operation of the milling business must be geared to handle as much cane as possible during the shortest possible economic period. C.S.R. mills usually operate for about six months of the year, between mid-June and mid-December.

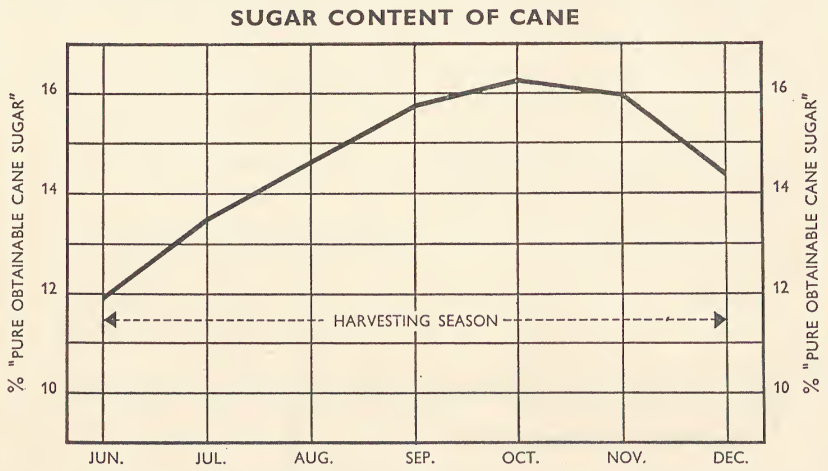
Sugar mills are classed as "heavy" industry, far too big, massive and expensive to be compared readily with other food factories like flour mills, butter factories, or fruit canneries. A medium-big mill, like Hambledon in Queensland or Rarawai in Fiji, with a capacity of, say, 45,000 tons of sugar per season, would today cost with its transport system almost £4 million. In relation to its supplying area this represents the surprisingly high investment, in the mill alone, of about £300 per acre of cane harvested annually. There is no counterpart of a sugar mill for size or for expense of capital equipment to be found in other food industries—and not many in any type of industry. And in sugar manufacture there is the additional process of refining, which is also heavy industry. The heavy investment factor is aggravated for business purposes by the short season of milling operations.

The overall result of these factors is unusually high overhead expenses per ton of output. Therefore for business and financial success

the highest possible output of sugar each season becomes a most important consideration, but this depends, first and foremost, on a full supply of cane. And it is important for the cane to be clean, fresh and sweet.

Almost all South Pacific sugar mills depend for their supplies of raw material on a large number of independent farmers; by contrast, for example, with a large copper smelter depending on its own single mine. It is in contrast, also, with overseas raw sugar industries where millers, to ensure full cane supplies for their mills (as well as to obtain the profits of growing), grow all or a large proportion of the cane on their own plantations. C.S.R. has to rely upon the farmers, almost all of them working farmers, producing their crops under the incentive of profit for themselves. A typical Australian grower harvests each year 750 to 1,000 tons of cane, and a grower in Fiji 110 to 140 tons.

As well as having points of difference, sugar milling has much in common with other manufacturing undertakings. Success requires adequate capital; a range and combination of specialized skills in buying, transport, engineering, processing; skilful organization and



In order to extract the sugar while the cane is rich in sugar the cane harvesting season usually extends from June when the sugar content starts to rise, until December when the wet season starts. Climate and type of cane affect the sugar content in the early and late months of the season. Recently-bred, late-maturing canes, such as *Trojan*, hold high sugar content until the late months. Cane breeders are now trying to breed varieties that will have a high sugar content early in the season. (The percentage P.O.C.S. content is of the order of 1% less than the sucrose content of the cane—see Appendix 23.) *Source: C.S.R. analyses for purchase of cane delivered to Macknade Mill, North Queensland—rough monthly averages 1950-54.*

management of men; and assured and not unremunerative markets for the final product. All this must be measured in monetary terms—the cost versus the market returns. But economics measure in material terms the results of the acts of men, and it is men, armed with tools bought by capital, who make sugar out of nature's resources. This chapter examines the functions of the capital tools and the teamwork of the various groups of men in making raw sugar from cane by the methods evolved by C.S.R. over eighty years.

Status as a Sugar Miller

C.S.R. is one of the world's largest raw sugar manufacturing companies, now ranking second or third in the world for tonnage of raw sugar produced. The other companies in the top half-dozen are American corporations operating in Cuba, San Domingo, Puerto Rico and Hawaii; and they also grow cane, which C.S.R. does not do to any significant extent. It makes about twice as much raw sugar as any other milling company in the British Commonwealth. In efficiency, its rating and reputation stand high in the sugar milling world.

The company owns twelve sugar mills of greatly varying sizes, some relatively small. Of the seven mills in Australia, three are in New South Wales and four in Queensland, and their current aggregate annual raw sugar production target is 261,000 tons; the target of the five mills in Fiji is 185,000 tons. The Australian mills process one-fifth of the total Australian cane crop, the balance passing through twenty-seven other mills owned by farmers' co-operatives and by other companies.

The company's two biggest mills are Victoria at Ingham, in northern Queensland, and Lautoka, in Fiji. While these are large by any standards there are much larger mills in the Caribbean. Victoria and Lautoka have each handled cane crops in excess of 650,000 tons in a season. Like many figures, it is difficult to grasp the physical import of this tonnage; put in another way, each of these two mills at the height of the season transports and crushes each week about 25,000 tons of sugar cane, which is equivalent to a continuous train of loaded cane trucks 17½ miles long or to the full cargoes of three typical overseas tramp ships.

In the good season of 1953 these twelve mills hauled over their 800 miles of permanent and 360 miles of portable railway line, and in their 200 river punts, a total of 3,170,000 tons of cane. From it they manufactured 438,000 tons of raw sugar and 97,000 tons of molasses. During the crush they employed 4,600 people. About 6,000 cane

cutters harvested the cane grown by the 12,950 farmers who supplied their crops to the mills and who depend for their families' livelihood on the successful harvesting and milling of their cane.

The shareholders of the company see in the annual balance sheet that £15,300,000 is shown under "fixed assets" as the book value of the twelve sugar mills. They would also know that it would cost far more to replace them new at today's inflated costs. In fact, it would cost at least £35 million. In old factories, as these in part are, replacement is occurring all the time, and the company's chairman has pointed out repeatedly that this presents a major problem under out-moded taxation laws in these years of inflation. It often pays a business better to repair and maintain old plant at high cost, because this expenditure is allowable for taxation purposes, than to replace it with more modern and more efficient plant. This is a bad situation when national policy should be aimed at increasing efficiency and improving output per worker by giving him more efficient equipment. Unfair and unwise though present taxation laws may be, the company has spent some £8 million since the war on replacing old plant and adding new plant and capacity in its mills.

The large C.S.R. investment in milling is widely scattered: along the eastern coast of Australia from 400 to 1,500 miles away from the head office in Sydney and, in Fiji, 2,000 miles away.

Contribution to Cane-Growing

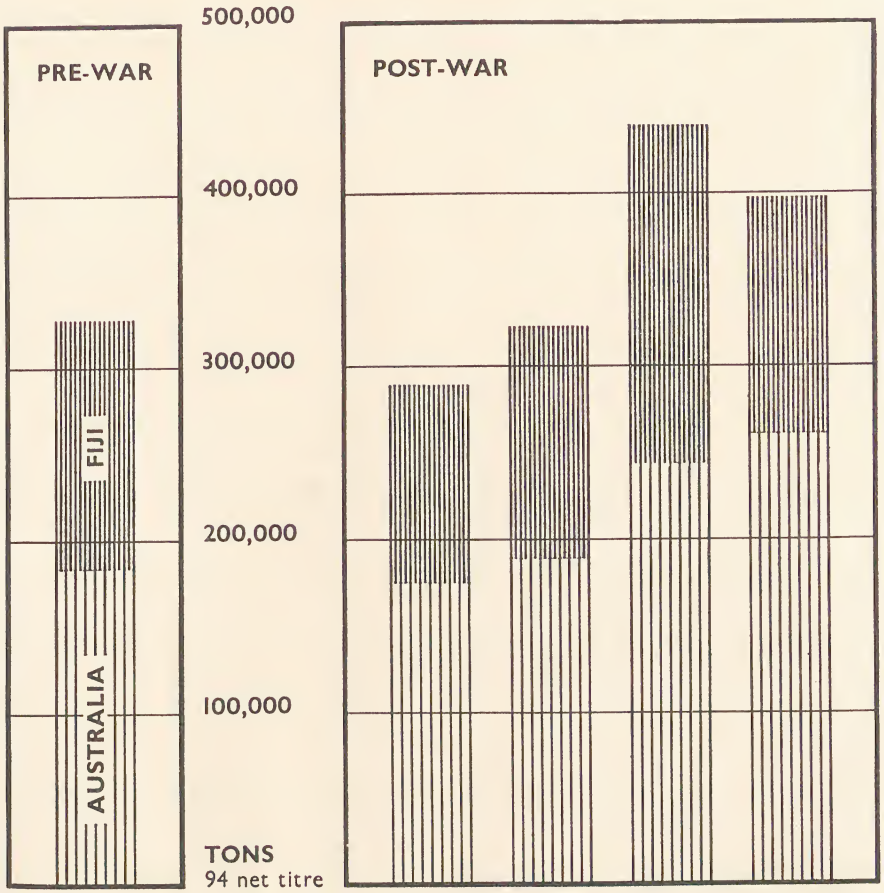
Before dealing with the actual operations of the mills, the contribution made towards the growing of sugar cane will be explained. The company grows no cane commercially in Australia, and only between 2 and 3 per cent of the crop in Fiji.

Over 85 years ago, even before the first C.S.R. mill was in operation in New South Wales, efforts were made to help the farmers grow good crops. In 1870 the company's first agricultural bulletin was issued, *Plain Hints to Plain Men for the Cultivation of the Sugar Cane* by Melmoth Hall, an officer of the company who was previously a planter in the West Indies. Over a period of ten to twelve years, Hall carried out a great many cultivation and varietal trials. His work probably constitutes the first major attempt at systematic investigational work in the raw sugar industry of Australia. It preceded chemical control in the factories.

Since then, attention to crop improvement has never slackened. All the company's mills have technical field officers whose job is to work with the farmers to improve their methods and to help in

PRODUCTION OF RAW SUGAR BY C.S.R. IN AUSTRALIA AND FIJI

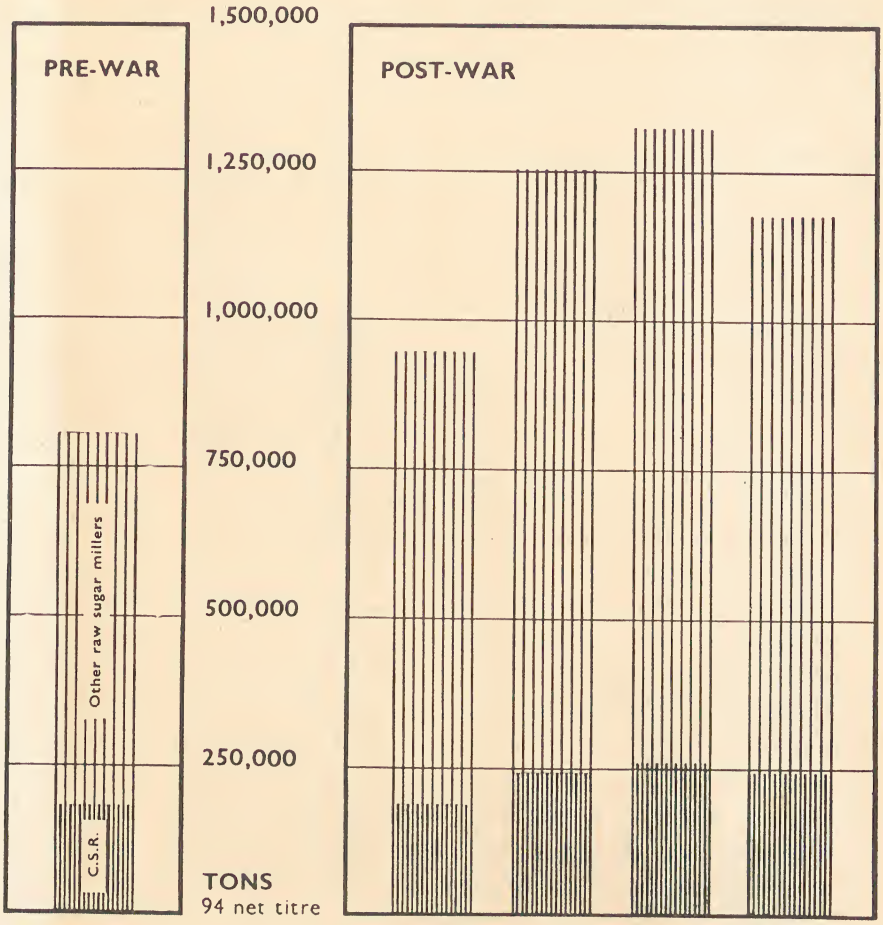
C.S.R. manufactures raw sugar at 3 mills in northern New South Wales, 4 mills in Queensland and 5 mills in Fiji. Quantities apply to cane harvesting seasons which occur in the second half of the calendar year. *Source: C.S.R. records.*



PRE-WAR average 1936-37-38		1951	1952	1953	1954
		(Seasons)			
43,435	N.S.W.	41,049	14,263	33,992	26,290
140,282	Q'LAND.	133,503	174,982	209,656	234,499
183,717	AUST.	174,552	189,245	243,648	260,789
144,268	FIJI	115,744	133,645	194,994	136,800
327,985	TOTAL	290,296	322,890	438,642	397,589

PRODUCTION OF RAW SUGAR BY AUSTRALIAN RAW SUGAR MILLS

There are 34 raw sugar mills in Australia: 14 of these are owned co-operatively by cane-farmers, 7 by C.S.R. and 13 by various other companies. C.S.R. produces about one-fifth of Australia's raw sugar. *Source: C.S.R. records.*



PRE-WAR average 1936-37-38		1952	1953	1954	1955
			(Seasons)		
183,717	C.S.R. MILLS	189,245	243,648	260,789	236,860
621,006	OTHERS	759,244	1,010,216	1,065,620	934,106
804,723	**TOTAL**	**948,489**	**1,253,864**	**1,326,409**	**1,170,966**

Hambledon Mill, near Cairns, North Queensland. The company owns four mills in North Queensland and three in northern New South Wales.

Nausori Mill, Fiji, with staff golf course in foreground. The company owns five mills in Fiji, four on the main island of Viti Levu and one on Vanua Levu.

Power house and boiler station at the company's Victoria Mill, Queensland.

Lautoka Mill, Fiji. Employees' houses in foreground, wharf and ship loading sugar in background.

Mill engines at Hambledon Mill. The crushing rollers are hidden from sight underneath the megass carriers on the right.

Mill engine and fly-wheel. These steam engines drive the rollers which crush the juice from the cane.

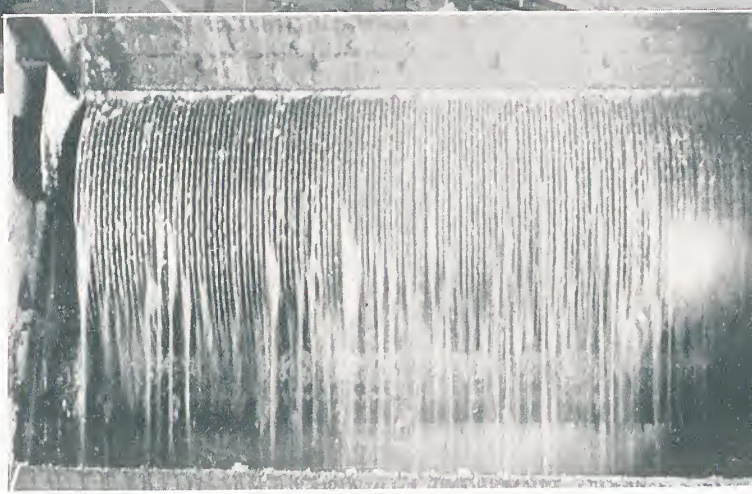
Laying portable line in cane field.

Farmer hauling empties from main line to field.

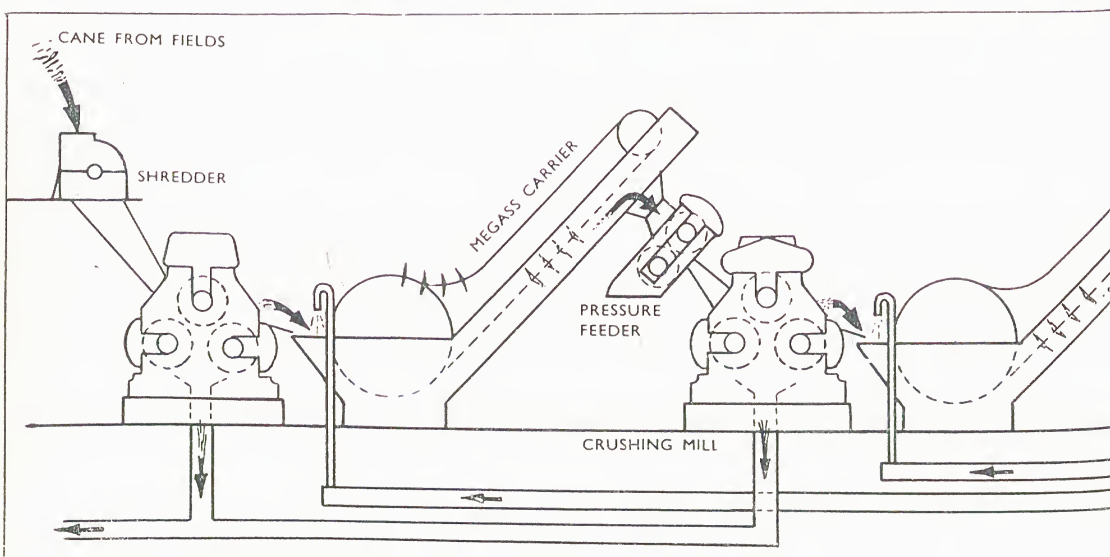
Loading cut cane on trucks standing on portable line in field. As the truck fills, cutters use a short ladder to load the heavy stalks of cane.

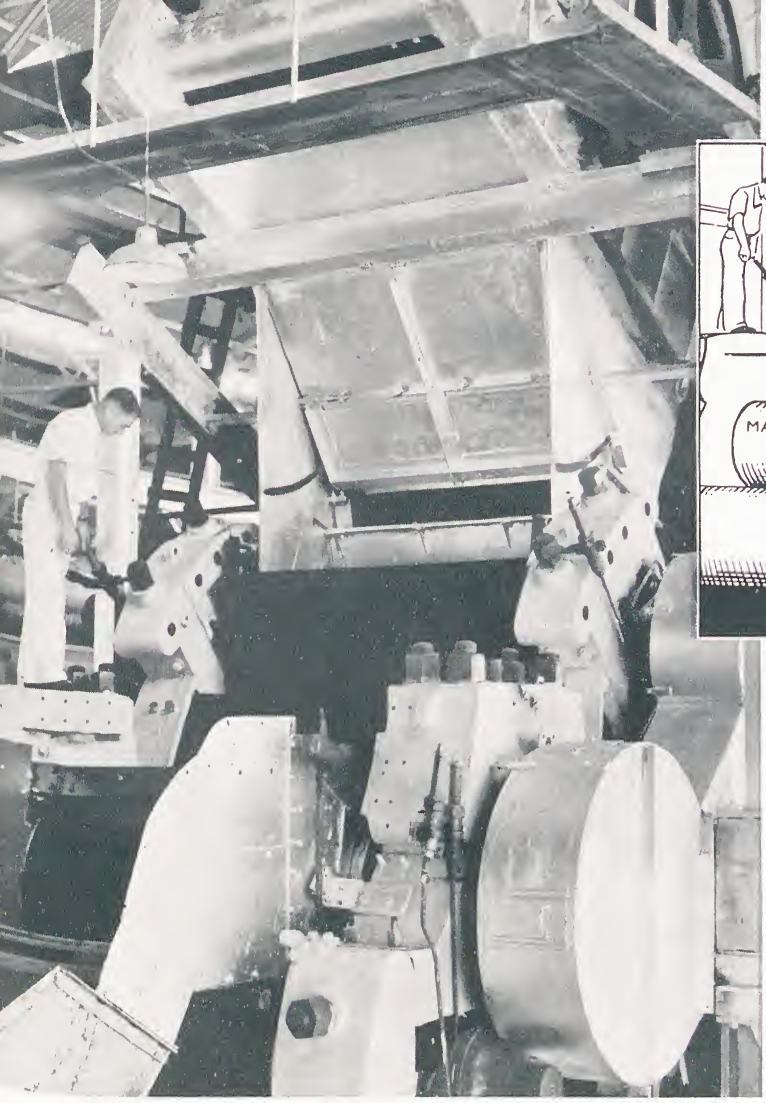
Loading cane on punt, Clarence River, N.S.W. A derrick is used to lift cane from farmer's tractor-drawn cart.

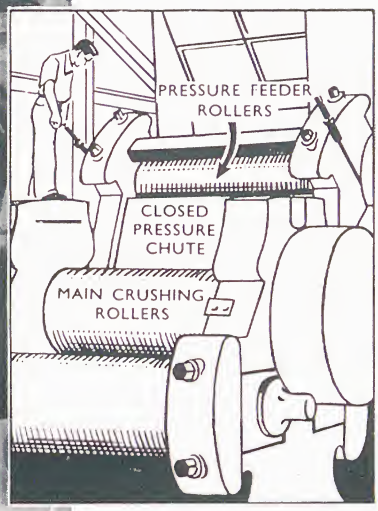
Weighing farmers' cane at mill.



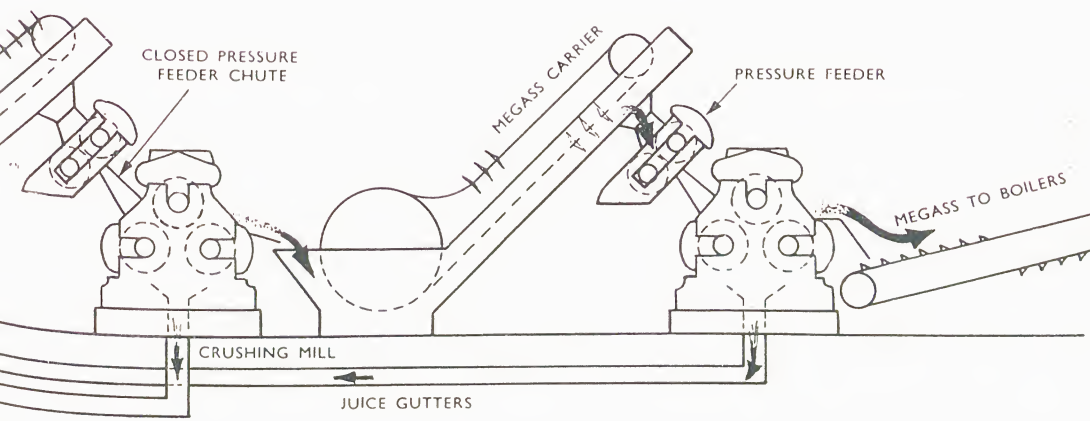
Juice is crushed from the cane fibre by large rollers arranged in sets of three. Rollers are of iron, grooved on the surface, and weigh up to 19 tons each.

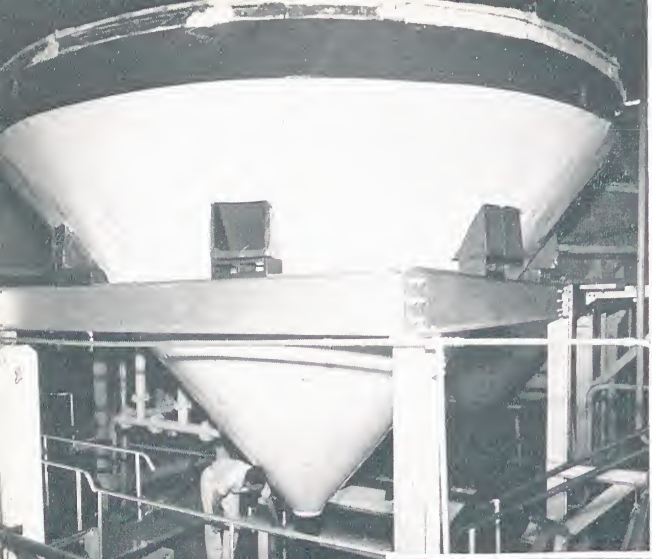






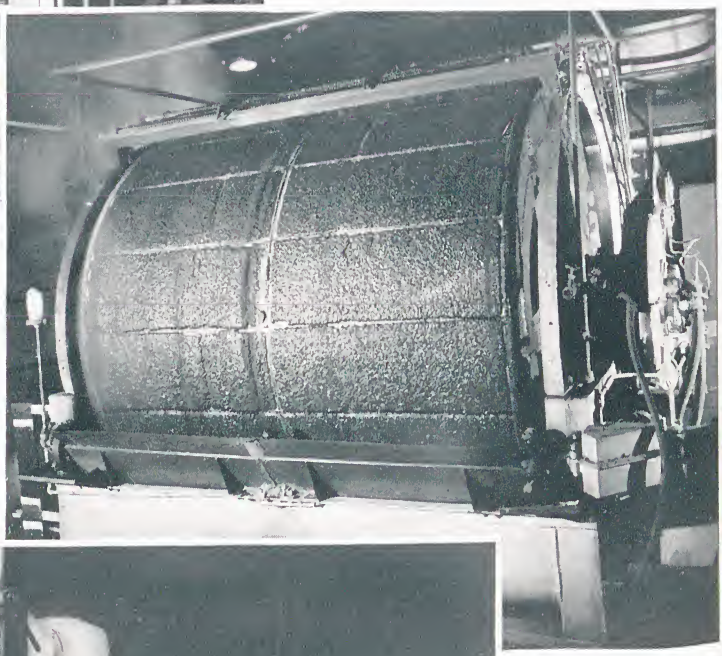
The C.S.R. Company has developed pressure feeders which consist of two subsidiary rollers which push cane fibre under pressure through a closed chute to the main crushing rollers. See diagram of milling train below.



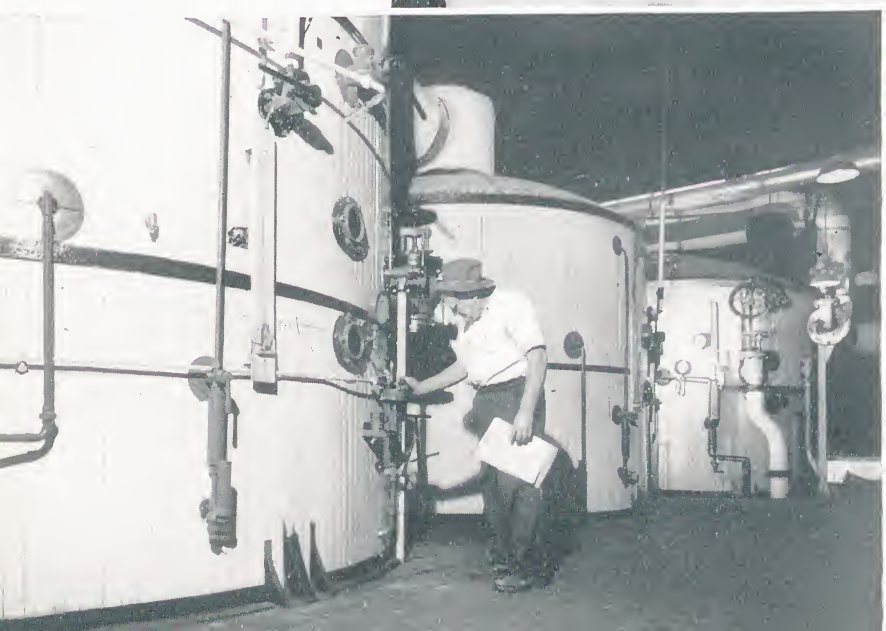


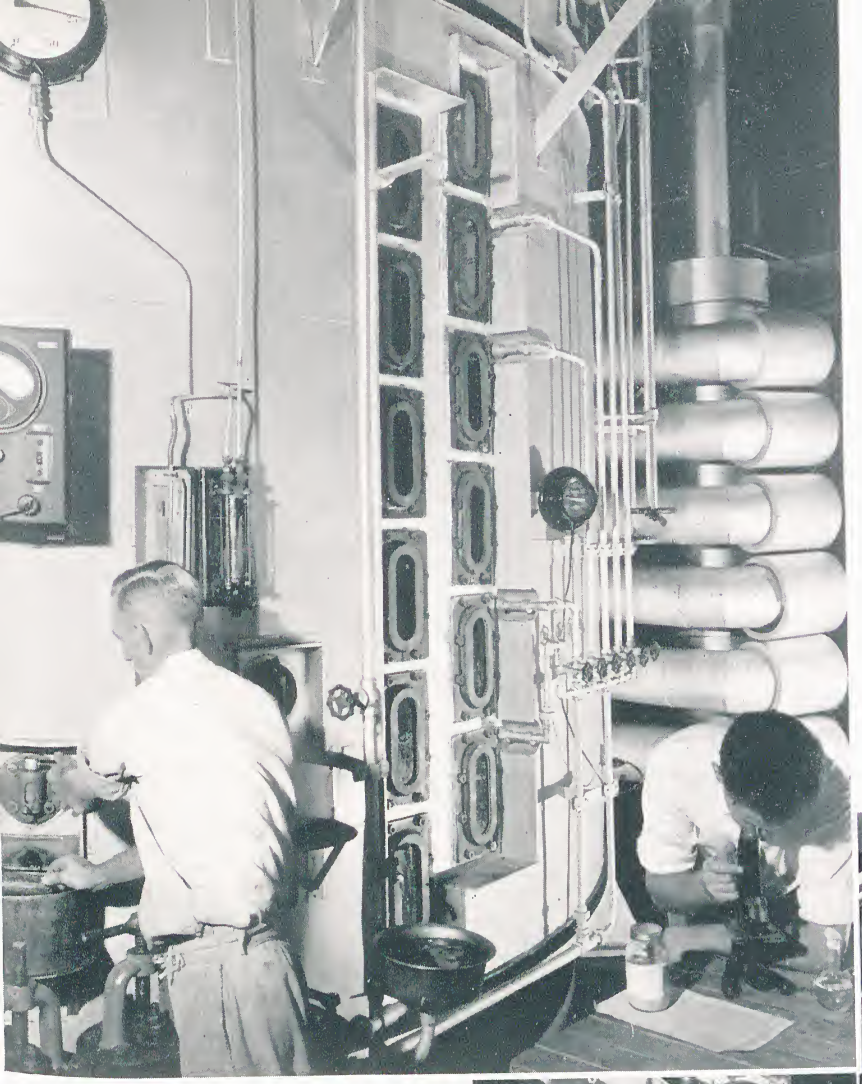
A vessel in which the impurities in limed cane juice settle out. This is an old-fashioned C.S.R. type subsider in the company's Broadwater Mill, still giving good service.

A rotary vacuum filter sucks out the sugar-containing juice from the subsided residues. The "mud" which is left is used as fertilizer.

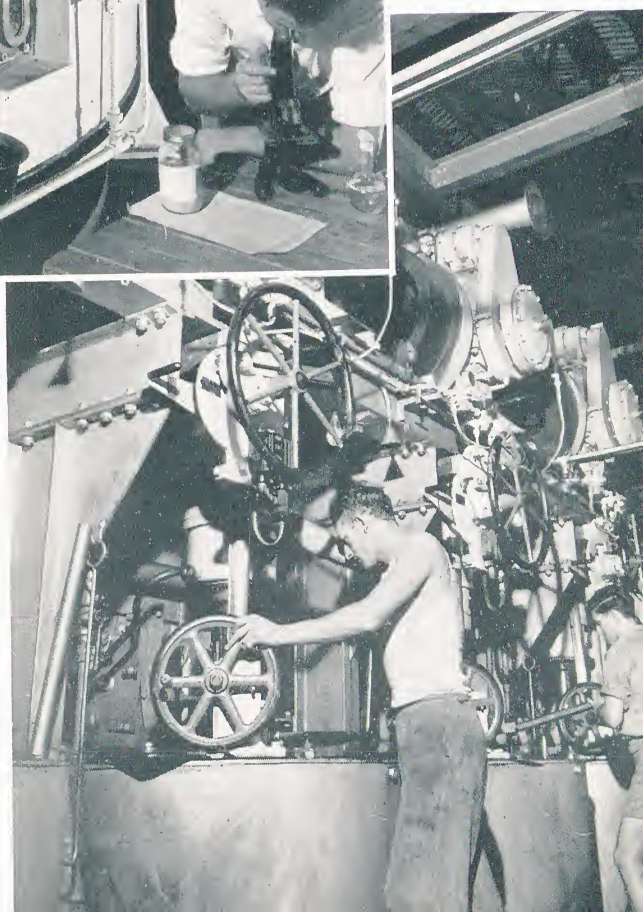


A series of old servants: timber sheathed effets or vacuum pots at Broadwater Mill, used to concentrate clear juice by boiling under vacuum.





A new 12,000 gallon vacuum pan at Victoria Mill. The sugar boiler is taking a test sample to check the process of crystallization, while a chemist examines crystals under a microscope.



A battery of automatic centrifugal machines at Victoria Mill. The centrifugal "baskets" spin at 2,200 revolutions per minute, throwing off the syrups and leaving nearly dry crystals of raw sugar.

Laboratory, Victoria Mill. Chemists analyse the cane juice and syrups at various stages in the process, the megass, the molasses, the water in the mill mains, etc.

A paddle wheel device for collecting samples of water from a main mill drain. Samples are analysed regularly to determine if any sugar is being lost through leaking pipes.

Mr H. Freeman, general inspector of C.S.R.'s Australian mills, (now retired) discusses plans for the duplication of Victoria Mill with Mr R. N. Selman *left* and Mr W. M. Livie *right*.

Mr G. J. Holden, cane inspector, Harwood Mill, talking to Mr John Skinner, secretary of local cane growers' association.

Harwood Mill, on the Clarence River, N.S.W. C.S.R. built its first mills on the Clarence in 1869, and established there the system of large central mills supplied by independent farmers. This system was eventually followed by the Australian sugar industry. Harwood is the oldest mill in Australia. It started crushing in 1870.

producing better cane crops. In addition, the Queensland mills have to meet their share of the expenses of the Bureau of Sugar Experiment Stations, an organization which was started by the Queensland Government in 1901 and now has a quite outstanding record of service to Queensland growers.

It may be asked why C.S.R. spends money on the agricultural side, in which it is not engaged. It is quite a rational policy and has been tested over a long time. Healthy cane, rich in sugar, is better for the miller as well as the grower. If yields per acre can be improved the crop will tend to be produced on land closer to the mill and transport costs to the mill will be lower. Mills become unprofitable unless the cane supply is full in quantity and good in quality. Cane-growing and milling are essentially a joint enterprise: what helps the grower helps the miller and vice versa; prosperous growers and millers are good for one another—and ultimately, too, for the consumer.

The company's technical field officers collectively possess a wide range of skills. There are the plant pathologists specializing in cane diseases, plant geneticists breeding their thousands of seedlings in the search for improved varieties, erosion and soil experts, and also plain "all-round" technical field men working with and for the growers on methods of cultivation, fertilizer trials, pest control, and the many questions which affect the health and productivity of this fascinating crop.

In the fight against insect pests, the company has been responsible for introducing birds, fish, parasitic insects and even a giant toad, *bufo marinus*, into Fiji. There is some doubt whether *bufo* worried the beetles very much, but the gruesome-looking creature certainly gives many shocks to the visitor when, for instance, he pops up unexpectedly in the bathroom.

Sugar cane will not grow well in sour, badly drained ground. This was appreciated at least 83 years ago, for a report by E. W. Knox, then manager on the Clarence River, said that "one or two farmers have already commenced to drain their land with tiles and to these we have lent money without interest to cover the expense of the tiles". Drainage continues to be important on all flat, heavy soils, particularly on the Tweed and Richmond Rivers in New South Wales and on the Rewa in Fiji. In addition, at Lambasa Mill in Fiji the company has built 23 miles of sea wall with 35 flood gates, in order to reclaim mangrove swamps and bring them under cane, grazing pasture and rice.

One of the most important methods of increasing the productivity of farms and reducing costs is the breeding of improved varieties of sugar cane, which are released to growers free of any charge. This

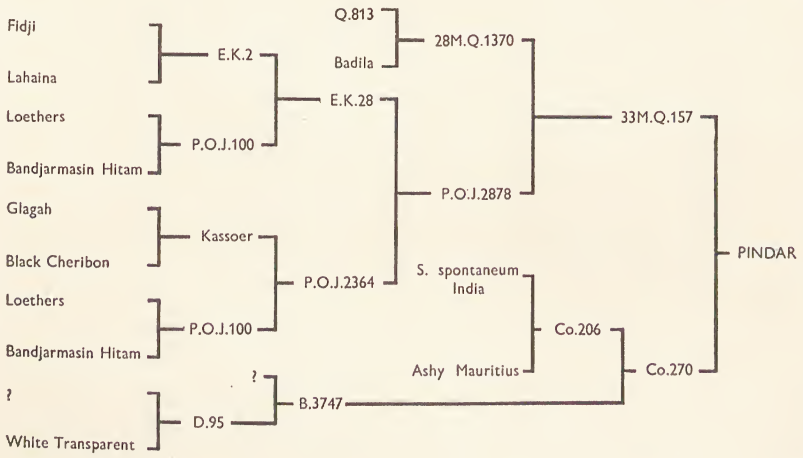
work calls for great patience, enthusiasm of the well-controlled kind and, for best results, that extra insight which is talent of a high order. Successful new varieties, in addition to possessing the inherent ability to increase the yield of sugar to the acre, must be resistant to drought and disease, and possess good ratooning and harvesting characteristics; and they should not present serious problems when they reach the milling operations.

The plant breeders know a great deal about how plant characteristics are transmitted from parent to progeny—for instance, whether some of the features desired in the children, the seedling canes, are more likely to come from the male parent or the female parent—and they make their crossings accordingly. Some blood lines, like a few "noble" and very sweet New Guinea native canes, transmit high sugar content, although nature is a little perverse in this and has ordained that sweetness should be a partially recessive quality. Others, including thin, wiry, "wild" canes from India, Java and other tropical countries, transmit vigour and strong root systems and, therefore, drought resistance and heavy yields to the acre.

Once a promising new variety has been produced in the nurseries, it has to be tested in the field and then it has to be multiplied for

PEDIGREE OF PINDAR CANE

Pindar (37 M.Q. 22) is a sweet, early maturing cane raised in 1937 by the C.S.R. Co. at the Macknade Field Experiment Station, Herbert River, North Queensland.



commercial planting. All this takes, probably, ten years, and out of every 10,000 or 20,000 seedlings maybe one or two, or none, will prove a successful commercial variety. Patience and a long view are required, but it is interesting and creative work.

The ability of cane to produce fertile seed was discovered in Java in 1885, although the discovery was not announced until 1888. In that year the discovery was also made independently in Barbados. The company immediately saw the possibilities of improving yields by growing new seedling varieties. In 1890 publications referred to the Barbados work and in April of that year arrangements were made to carry out trials at all C.S.R. mills. The first seedlings were raised in 1891 at Harwood and in 1892 at Broadwater and Lambasa, although some years were to pass before successful new commercial varieties were developed.

The company now has one breeding station in Queensland, one in New South Wales and two in Fiji. There have been striking successes which, perhaps, justify the heroic names the company gives to its new cane varieties. *Jason*, *Atlas*, *Comus* and *Ajax* have given good results in the past. *Vesta* has proved a most valuable two-year cane for New South Wales. *Trojan*, *Eros* and *Pindar* have the notable achievement of having increased the yield of sugar per acre in some of the large cane districts of northern Queensland by 20 per cent. Such an increase from the same area, farmed with practically no added expense except for harvesting the heavier tonnage, is a tremendous economic advance; other things remaining constant, it would increase the growers' profits alone by considerably more than 50 per cent. No wonder *Trojan* was affectionately christened the "mortgage lifter" by the growers in one northern Queensland area.

Disease has for long been the dreaded enemy of cane industries and has left a long history of economic and social ruin. In the early days of the cane industries in the South Pacific almost every known cane disease was unwittingly imported, in the zeal of those concerned to get the best varieties from all countries of the world. Through the efforts of the Bureau in Queensland and of the company in New South Wales and Fiji, and in part in Queensland, cane diseases have been eliminated or brought under control. One of the important successes of our plant pathologists was in controlling gumming disease which constituted a drastic threat, at different times, to the industry in New South Wales and parts of Queensland. Serious diseases controlled, and in some cases eliminated, include Fiji disease, downy mildew, gumming, leaf scald, and mosaic; but the position is maintained only by constant vigilance. Indeed, Fiji disease and downy

mildew remain endemic in Fiji and are limiting the growing of susceptible varieties which, if they could be grown with safety, would raise production considerably.

Today, the entire crop in New South Wales is produced from C.S.R. varieties, while in the Queensland crop milled by C.S.R. the proportion is 89 per cent and in Fiji 60 per cent.

Purchasing the Cane

The agreement covering price, terms and conditions of cane purchase is where grower and miller meet and where their interests both clash and combine. Naturally, it has been the subject over the years of a great deal of discussion and negotiation.

Four important elements in the situation are: the transporting of the cane, the quantity (weight) of cane, the quality of the cane, and the price of raw sugar.

The mills transport the cane over their tramline and punt systems at their own expense, which is a great advantage to the more distant growers. In many cases they would not grow cane if they had to bear the cost of transporting it.

The weight of cane determined at the mill weighbridge is an obviously basic factor and has always been used when paying for cane.

The sugar content is taken into account in three ways in the sugar world: on the basis of the sugar actually made; on the polarization (or percentage sugar content) of the juice; and on a wider analysis which incorporates the polarization and allows for other factors, including the impurities and fibre, affecting the amount of sugar which mills can recover. The company's unique P.O.C.S. (Pure Obtainable Cane Sugar) formula is an example of the latter type and is given in Appendix 23. Dr Kottmann evolved this formula in the 1880s to measure the amount of sugar which mills should recover from the cane received. It was logical for the company, which had tried to find a way to pay for cane according to its sugar content when it was starting milling in the late sixties, to apply a proven formula to cane purchase. This was done in 1899 and this early application of a method which was at once equitable and incentive-producing has stood the test of time for over half a century. Subsequently, the P.O.C.S. formula came to be applied generally throughout the Australian sugar industry under the name of the Commercial Cane Sugar formula (C.C.S.).

This system puts the onus on the grower to grow cane rich in sucrose and rewards or penalizes him accordingly. The miller pays for the

analysed amount of recoverable sugar in the cane, which is a powerful incentive towards high standards of efficiency on his side.

The P.O.C.S. formula is not used outside the South Pacific sugar industries. Only in comparatively recent times have similar systems been used in a few other countries. A number of others use the outright sugar-in-cane basis, and others again relate cane price to actual *average* yields of sugar obtained by the mill from all growers. A return to this last system occurred in Fiji in 1940 for local reasons and at the wish of the growers, but it is fundamentally not as good a system because it does not produce the same force of individual responsibility, rewards and penalties.

The application of the obtainable cane sugar formula to cane purchase in 1899 was the first of its kind in world cane sugar industries. It may well have been the first system fully organized over a range of mills which took sugar-in-cane into account. Research indicates, however, that, although not general, some mills in Louisiana in the nineties were apparently making adjustments to cane prices by reference to the polarization; and one report suggests that one mill in Demerara had a similar practice in respect of "villagers' canes" in the early 1880s.

It is customary, and correct, to give to the P.O.C.S. cane payment system a great deal of the credit for the South Pacific industries obtaining the highest ratio in the world of sugar to cane, because of its impact on the grower and on milling efficiency. Without favourable climatic conditions in the form of cooler and drier months to ripen the cane as harvesting starts, however, such ratios would not have been possible. Respect should also be paid to that famous sweet cane, *Badila*, which was brought from New Guinea by Henry Tryon's 1896 expedition. It set the standards and dominated the cane varietal position for thirty to forty years.

The value received by millers for raw sugar is the fourth main element determining the price of cane. It has always been a strong general factor influencing cane price over any lengthy period, but it has not always been directly linked (mathematically for each season) with the price of cane, in a way that intimately associates growers' fortunes with the ups and downs of the sugar market. This stage has not been reached until the ups and downs have been evened out by some scheme of stabilization of the market returns; failing that, the growers have been glad to allow the impact of market fluctuations to fall on the millers. In Australia this part of the system of cane purchase did not come into operation generally until World War I, when government controls had stabilized the raw sugar price. Some mills had been

operating such a system before then and its origin cannot be accurately stated. C.S.R., from at least 1906, had given its growers the option each year of applying this system but few took up the option, preferring the specific price which was the alternative.

In Fiji the company protected the growers from market changes, so that they could have stability and confidence, until 1940 when a new agreement was made which related the price of cane to the price received for sugar season by season. The wartime sugar sale arrangements with the United Kingdom Government had given stability to the sugar price for the first time.

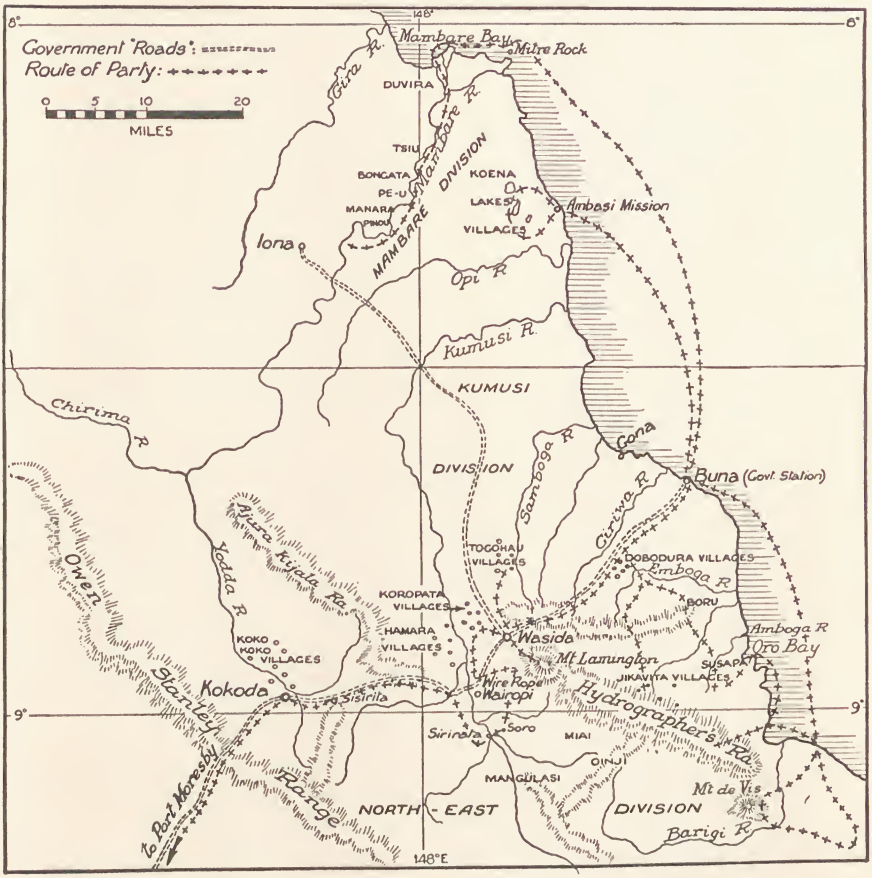
Without exception the company has come to mutual agreement with its growers in New South Wales and Fiji on cane price and conditions. Looking back over the long period during which it has been buying cane, it is a fair summing up to say that only on rare occasions have serious difficulties arisen between the company and its growers. In Queensland, too, C.S.R. has almost invariably come to mutual agreement with the growers, although there has been an arbitral authority operating there since 1916, and, over the years, there has naturally come to be no great difference between the agreements at the company's mills and the decisions of the tribunal as applicable to the rest of the Queensland industry. On occasions, wide differences of opinion have existed early in the negotiations and have eventually been reconciled by patient consideration of each other's viewpoint.

Harvesting and Transporting the Cane

The handling of milk and cream in a dairying district has special features because of their highly perishable character, but the bulk and weight of dairy products are insignificant compared with cane, and sugar cane, too, is highly perishable and should be milled, if possible, within twenty-four or thirty-six hours of cutting; moreover, the butter factories or milk depots work throughout the year, whereas the cane crops must be handled in five to six months. With wheat or wool there is not the same urgency in handling because they do not deteriorate rapidly, and their processing is widely spread and not closely related to the producing areas; yet the tonnage of the wool clip for the whole of Australia is only about one-sixth of the tonnage of cane handled in a season through the company's twelve mills.

"The crush" is a period of intense effort—from the farm, through the harvesting and transport system, and right through the mill. There is, once experienced, a not easily forgotten fever of activity and an infectious atmosphere of purpose and drive to get on and finish the job.

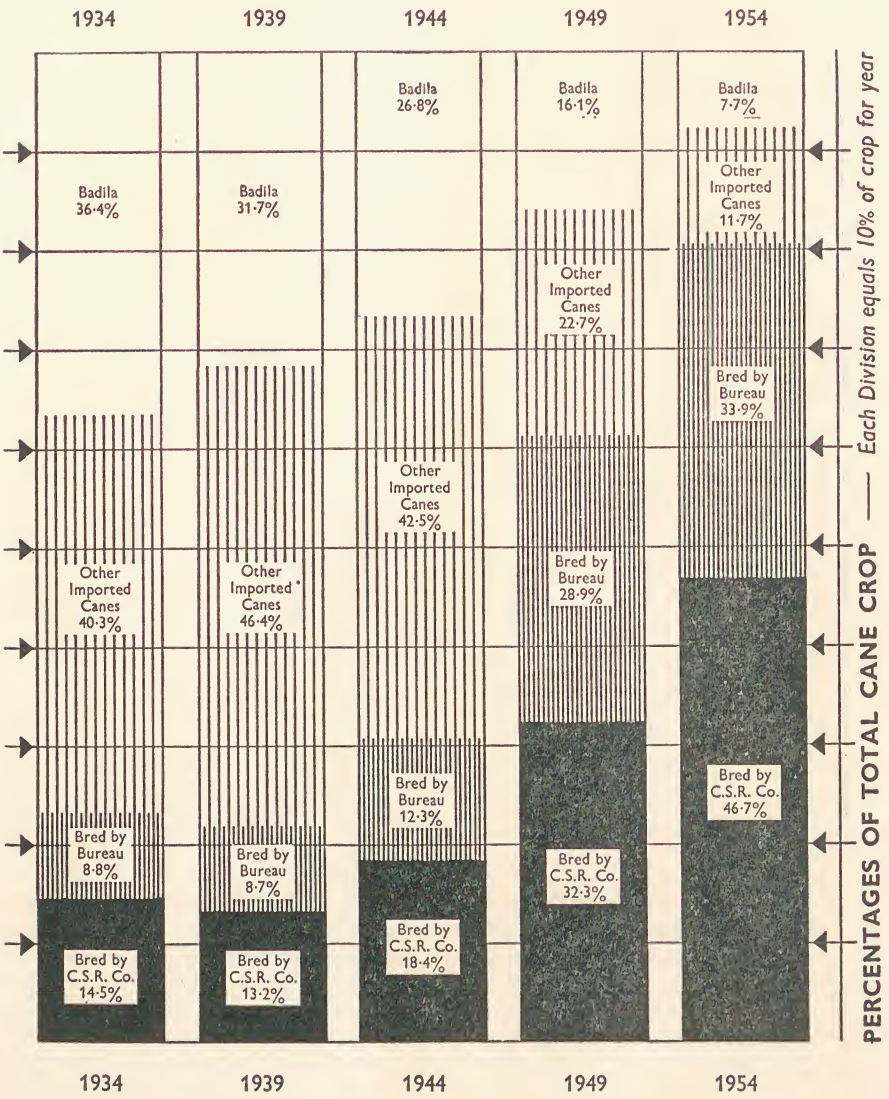
ROUTE OF C.S.R. CANE COLLECTING EXPEDITION TO PAPUA 1914



The expedition, under the leadership of Messrs A. M. Carne and C. Baker of C.S.R., set out from Buna on 31 May 1914; collected 29 varieties in the Mt Lamington district; returned to Buna; sailed south to the Barigi River district, and north to the Mambare River district. 77 varieties were collected. The expedition finally set out from Buna to Port Moresby over the Kokoda Trail but collected no canes because the area between Kokoda and Moresby was drought-stricken, and the natives had eaten all their cane. The varieties collected were tested at the company's field experiment stations in Queensland and Fiji. Several became of commercial importance and are among the ancestors of highly successful modern canes such as *Trojan*, *Eros* and *Vesta*.

VARIETIES OF CANE GROWN IN AUSTRALIA

Percentages of Australian-bred and imported canes, grown throughout the industry in Queensland and N.S.W.



The heading "Bureau" refers to the Queensland Bureau of Sugar Experiment Stations. Included under this heading are canes produced last century by the Queensland Acclimatisation Society. Under the heading "C.S.R. Co." are included canes bred by C.S.R. in Fiji and imported into Australia. *Source: Bureau reports for Queensland, C.S.R. records for N.S.W.*

Gumming disease in cane: the effects on leaf and stalk.

Gumming disease provided a grave threat to New South Wales farmers in the 1890s and to farmers in parts of Northern Queensland until recent times. Control of the disease has been effected mainly through breeding and use of resistant varieties of cane.

In the crush, everything in the mill district is geared to the capacity of the mill, and this affects everyone in the industry. For instance, the rate of crushing practically fixes the number of cane cutters. Goondi Mill, in Queensland, crushes at 105 tons an hour; this requires 2,520 tons of cane a day and, as Australian cane cutters cut and load, on an average, almost 7 tons per man per day, 388 cutters were signed on at the beginning of the 1955 season. The cane cutters work in gangs of six or seven men, at contract rates of pay (paid by the growers), and are directed from farm to farm by the cane inspectors in accordance with the harvesting programme.

The grower has the responsibility for the cutting of the cane, for loading it on the cane trucks on the portable line laid into his fields, and for hauling these loaded trucks by tractor (or often by animal power in Fiji) to the main tramline. A small proportion of the cane crushed at the company's mills is loaded onto lorries in the field and carried to main lines; and, where river transport is the method, it is hauled to derricks on river banks for transfer to cane punts. In C.S.R. mill areas in Australia, to cut the average farmer's cane requires four or five weeks' work from the cutting gang. This would be divided into two, or perhaps three, periods of work on each farm, in accordance with a carefully worked-out harvesting programme and the cane inspector's decisions. The smooth co-ordination of cutting and loading on individual farms in every corner of the mill's supplying area and speed in getting such large quantities to the mill in an even flow are justly regarded as exacting tests of men and organization. Moreover, they call for excellent co-operation between grower and miller.

The cane inspectors in Australia and the field superintendents and the traffic officers in Fiji are responsible for the supply of cane to the mills. For them the mill is a great hungry beast into whose gaping maw they must pour, night and day, an endless meal of cane—as much as 5,000 tons in a night and a day at the biggest mills. The full trucks of cane have to be pulled away from the fields, assembled on the main line and at shunt lines, and hauled to the mill; and a constant supply of empties has to be returned in the right numbers at the right time to the scattered gangs of cutters. The loco drivers, train crews and traffic men work in shifts, twenty-four hours of the day, to keep the trucks flowing and the marshalling yards at the mill stocked with a few hours' supply of cane.

The mill tramline system, a light railway of 2 ft. gauge, is the great artery of the cane-producing area. It is located according to practicable grades, the distribution of the good cane lands, and the geographical and historical facts which originally determined the location of the

mill. Once established, it largely determines the location of new farms and even townships, and it ties together and serves the whole cane-growing area. The maps of the mill areas show the relation between the cane transport system and the strung-out fertile cane lands.

This method of cane transport, with portable line laid to take the trucks right to the cutting gangs at the cane face, is a distinctive feature of most of the South Pacific sugar industries, especially in C.S.R. areas. It is used abroad, for instance in Jamaica, but, as far as is known, it is not found to the same predominating extent in other cane industries. In general summary, it saves double-handling of the cut cane (which the lorry or cart systems, from cane face direct to mill, also do); it helps longer hauls to be made more economically and evens out the value of cane farming land; it affects soils that are inclined to compact less than other methods and minimizes damage to cane stools and subsequent ratoon crops; it allows harvesting to continue when fields are wet and boggy; and it reduces the growers' expenses. A disadvantage is the high capital cost to the millowner, and it may prove less adaptable to mechanical harvesting than to present methods. Over the years the tramline method has had a strong beneficial influence by stretching out to and keeping cane-growing to flatter, moister and less erodable land; in the long run such land gives higher average yields.

Lautoka tramline extends in one direction for 82 miles from the mill. Victoria Mill's longest haul is 35 miles. The longest and costliest average hauls are Lautoka 27 miles, Victoria 16, and Hambledon 9. Goondi, on the other hand, is favourably situated near the centre of a compact cane area, with 3·7 miles for its average haul.

When the cane inspectors and field and transport officers have seen the harvesting and delivery of cane completed to time, their performance will be judged by such things as the cost per ton-mile of cane hauled, the speed of turn-round of trucks, and the absence of lost time in the mills through shortage of cane. In helping to organize the harvesting work efficiently, they have to exercise the right combination of co-operation and firmness towards growers and cutters. Differences of opinion naturally occur and disputes require just, prompt and calm settlement. In Australia, cane inspectors serve as officers of the Arbitration Court to give prompt, on-the-spot decisions about fair rates of pay for cutting tangled and difficult cane.

Technology for Economic Ends

At the "tip" of a big mill in the crush there is the throbbing of the mill engines, the roar of the disintegrators smashing up the cane stalks,

the punctuating crash as cane trucks, uncoupled from the long rake stretching back down the yard, are tipped, dumping their two and a half tons of cane, holus-bolus, onto the slats of the huge conveyor; there is a vista along the "crushing train" of the successive sets of giant rollers, with conveyors climbing to the top of each set, and of the remorselessly-revolving 18 ft. diameter flywheels of the mill engines; there may be dust in the air and in the eyes from the cane and the marshalling yards; the grassy-sweet scent of cane blends with the characteristic pungent, sour-sweet smell of raw sugar and molasses. All this combines to create an atmosphere of its own, never forgotten by mill men.

At the mills on the three northern coastal rivers of New South Wales and at Nausori on the Rewa River near Suva most of the cane arrives by river punt and is unloaded by grab. This is even more picturesque, with the string of punts stretching out behind a towing launch along the beautiful waterways.

The function of the factory is to make a capture, in commercial conditions, of the sucrose produced by nature and farmers. Fundamentally, the miller is concerned with two interrelated tasks: the physical task of recovering the highest possible proportion of the sugar in the cane and the financial task of recovering it at the lowest possible cost. Each task conditions the other; neither is an absolute goal in itself.

A general picture of what happens in the milling process, until raw sugar and molasses are produced as the final products, has been given in earlier chapters. A sugar mill is designed and developed to a capacity which is a reasoned compromise to meet two main considerations: first, the necessity to handle the cane while it is rich in sugar; secondly, the heavy capital expenditure—and hence the cost for maintenance, depreciation and profit—required to provide increased milling capacity. It is out of the question to provide enough plant to handle the crop in the two or three months of maximum sweetness and, in any case, the harvesting and mill labour would not be available in sufficient numbers for such a short season of work.

Sugar cane, the material on which the mill works, is a variable material and its qualities are, to a degree, unpredictable. It is a product of nature and varies with soil, climate, variety and fertilizers used. It differs from year to year according to seasonal conditions—droughts, floods, disease, pest damage—and from human factors, such as when bad harvesting sends in rubbish, tops, and soil with the cane. Much is known of its chemistry and physiology but there are still gaps in knowledge and unforeseen factors arise. The chemists and engineers

must be forever on the alert, constantly sampling and testing and observing their instruments, ready to adjust the process at a moment's notice.

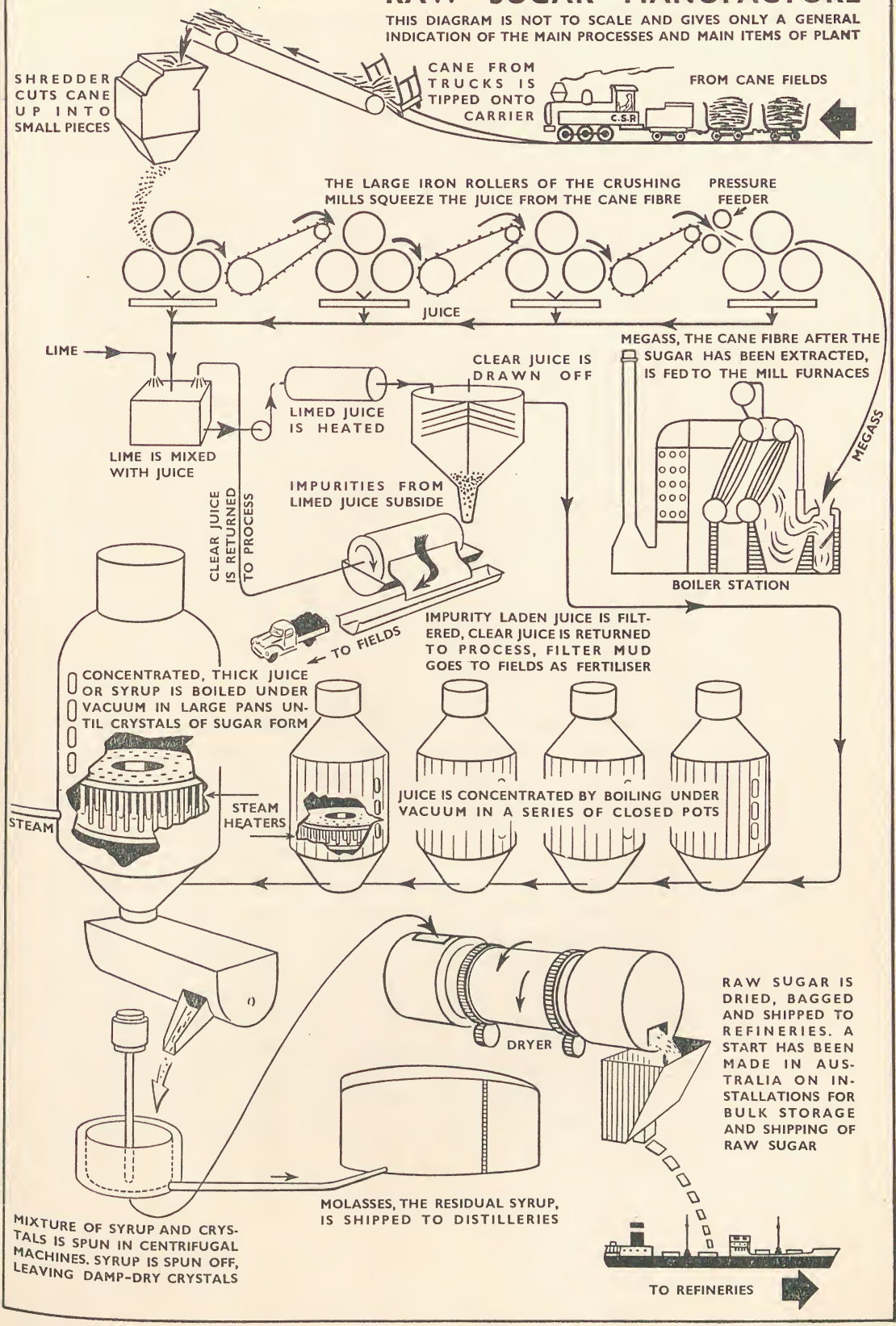
As the cane is received, it is weighed and sampled. By means of the polariscope the sugar content is measured. The percentages of fibre and of other non-sucrose components, called impurities, are also determined. From every 100 tons of sugar introduced to the mill in the cane and measured in this way, the amount captured in raw sugar in modern mills throughout the world falls within a range of 82 to 89 tons, exceptional cases excluded. The Director of the Queensland Bureau of Sugar Experiment Stations, speaking in general terms, recently said, "of the cane sugar taken into the mill in cane, about 86 per cent is recovered. The remaining 14 per cent is lost." For the C.S.R. mills in the 1954 season the proportions of the various losses and of the sugar recovered are as follows:

	On basis of overall loss	
	Best 6 mills per cent	*Worst 6 mills per cent*
Lost:		
In fibre (megass)	3.92	3.95
In mud from filters	.36	.37
In molasses	6.76	7.77
In various ways: leaks, drains, destroyed by acids, excess heat and bacteria, and lost in transport to refineries	0.95	2.52
Total lost	11.99	14.61
Recovered:		
Made into raw sugar and delivered to buyer	88.01	85.39
Introduced in the cane	100.00	100.00

These figures are a summarized form of what is locally called in the mills the "chemical balance"; more accurately described, it is the sugar balance or polarization balance. The above figures, particularly for "lost in molasses" in the case of the "worst 6 mills", were adversely affected by rubbish (up to 6 per cent) received with the cane, by interrupted crushing because of shortage of cane cutters, and by difficult flood-damaged cane. In New South Wales, partly for these reasons and partly because of a small crop, the mills operated at an overall financial loss in 1954. At a number of C.S.R. mills in 1954 fibre was high and the "purity" of the cane was low, which unavoidably

RAW SUGAR MANUFACTURE

THIS DIAGRAM IS NOT TO SCALE AND GIVES ONLY A GENERAL INDICATION OF THE MAIN PROCESSES AND MAIN ITEMS OF PLANT


SHREDDER CUTS CANE UP INTO SMALL PIECES
CANE FROM TRUCKS IS TIPPED ONTO CARRIER
FROM CANE FIELDS
C.S.R
THE LARGE IRON ROLLERS OF THE CRUSHING MILLS SQUEEZE THE JUICE FROM THE CANE FIBRE
PRESSURE FEEDER
JUICE
LIME
LIME IS MIXED WITH JUICE
LIMED JUICE IS HEATED
CLEAR JUICE IS DRAWN OFF
MEGASS, THE CANE FIBRE AFTER THE SUGAR HAS BEEN EXTRACTED, IS FED TO THE MILL FURNACES
MEGASS
BOILER STATION
IMPURITIES FROM LIMED JUICE SUBSIDE
CLEAR JUICE IS RETURNED TO PROCESS
TO FIELDS
IMPURITY LADEN JUICE IS FILTERED, CLEAR JUICE IS RETURNED TO PROCESS, FILTER MUD GOES TO FIELDS AS FERTILISER
CONCENTRATED, THICK JUICE OR SYRUP IS BOILED UNDER VACUUM IN LARGE PANS UNTIL CRYSTALS OF SUGAR FORM
STEAM
STEAM HEATERS
JUICE IS CONCENTRATED BY BOILING UNDER VACUUM IN A SERIES OF CLOSED POTS
DRYER
RAW SUGAR IS DRIED, BAGGED AND SHIPPED TO REFINERIES. A START HAS BEEN MADE IN AUSTRALIA ON INSTALLATIONS FOR BULK STORAGE AND SHIPPING OF RAW SUGAR
MOLASSES, THE RESIDUAL SYRUP, IS SHIPPED TO DISTILLERIES
MIXTURE OF SYRUP AND CRYSTALS IS SPUN IN CENTRIFUGAL MACHINES. SYRUP IS SPUN OFF, LEAVING DAMP-DRY CRYSTALS
TO REFINERIES

increased losses to an unusual extent in the megass and even more in the molasses. Seasonal conditions affect the sugar balance in ways which are in some degree beyond the control of the technologists.

What is the importance of such technical figures and the mass of technical data and jargon that lies behind them? "Technology," says Webster, "is not an independent science . . . but consists of applications of the principles established in the various physical sciences—chemistry, mechanics, etc.—to manufacturing processes." This definition, however, does not sufficiently stress the relation of technology to business necessity. Growers are not paid for cane, but for the recoverable sugar in the cane. The purchase price constitutes rather more than 70 per cent of the mills' total costs. If, therefore, the chemists and engineers lose more than the absolute minimum of this costly yet unstable and perishable material, the manager of the mill, the inspectors in the head office and the general management of the company are likely to become exceedingly terse.

A variation of 1 per cent in the sugar recovered as crystals represents about £20,000 in a biggish mill over the season—if gained that is fine, but if lost there would be some hard thinking and action. A variation of 3 per cent for the season, which could happen if rubbish came in with the cane, if control were bad or equipment inadequate, would amount to as much as £90,000 in the largest mills. The importance of fresh, clean cane and of efficiency in extraction and recovery of sugar from the juice is very clear.

There is one principal aim behind technical advances—to cheapen the final cost of the product to be sold. That way lies greater profit as the first result but, subsequently, there follow cheaper sugar for consumers, increased cane prices for the growers, increased wages and salaries, or a combination of all those things.

One very desirable kind of technical advance is the one which makes more effective use of existing capital, by getting more tons per hour through existing plant or by simplifying and cheapening plant by improvements in design. In the present period of grave inflation and very high costs of additional equipment, these possibilities assume major importance. More investigation, closer supervision, more attention to "know-why" as well as to "know-how", and more scientific measurement and "instrumentation" give accretive, yet cumulatively significant, gains—in lower costs, more profit, or less capital expenditure. While further improvement is difficult because the milling process is an old one and many able men in many parts of the world have worked on it, technical advances must be sought if reasonable profits are to be made.

New ideas and improvements have many origins. Overseas visits by company officers are one source. Another is from chemists and engineers on the job, who not only keep the plant running by standard methods but are expected to suggest improved methods. Constant attention to improvement is given also by senior technical inspectors in the head office and by the central technical services, including the comprehensive technical library and the large technical research department. Some officers are relatively free of day-to-day administration, so that they can concentrate on improvements and developments.

One fairly recent successful example of progress by inventiveness within the company is the "pressure feeder", developed by the chief mill engineer. It delivers the shredded cane to the main crushing rollers under continuous forced feed and increases the capacity and efficiency of the crushing plant. The use of this device is now spreading into Australian mills other than those of the company and overseas millers are becoming interested in it.

Success does not attend all efforts to solve problems—at least not quickly and easily. An instance is the attempt, as yet unsuccessful, to eliminate the troublesome and costly deterioration which still occurs in raw sugar despite every care by known methods. A loss of $\frac{1}{2}$ per cent of the sucrose between manufacture and final delivery of the raws to a refinery would cost perhaps £10,000 on one mill's annual output. The C.S.R. research department, after several years' investigation, identified the main organism, *aspergillus glaucus*, that was causing this; in theory there are remedies, and some improvement has been obtained, but as yet no method that is economic in practice has been developed to prevent the airborne spores from making contact with the sugar or from multiplying in tropical atmospheric conditions of warmth and moisture and doing some damage.

The science of "sugar crystallography", the study of the formation of the crystals at the final stage of boiling, is being applied to improve the design of the vacuum pans and the "instrumentation" of them, so helping to economize in the use of steam and to give more evenness in the raw sugar crystals. Improvements in the "steam balance" and the installation of new and costly furnaces and boiler stations have reduced the cost of coal and wood needed to supplement the mills' megass fuel; working conditions are also better at these new stations.

All products of the mill process are utilized: the cane fibre to feed the furnaces and a little for the manufacture of "Cane-ite" insulating board, the molasses by distilleries, and the filter mud by the growers as fertilizer. An interesting point is that even the water in the cane

stalk, which represents 70 per cent of its total weight, is put to good use. C.S.R. practice is to give the crushed cane fibres a longer and more intense soaking, called "maceration", than in most overseas countries, as one of the methods of extracting maximum sugar. Some mills do not have abundant natural water supplies for steam and maceration and are concerned with their "water balance". These mills can get 100 per cent of their total water requirements, except when starting up, from the water in the cane juice, which is recovered as steam from the evaporators and pans, condensed back to water, and re-circulated.

Management and Men

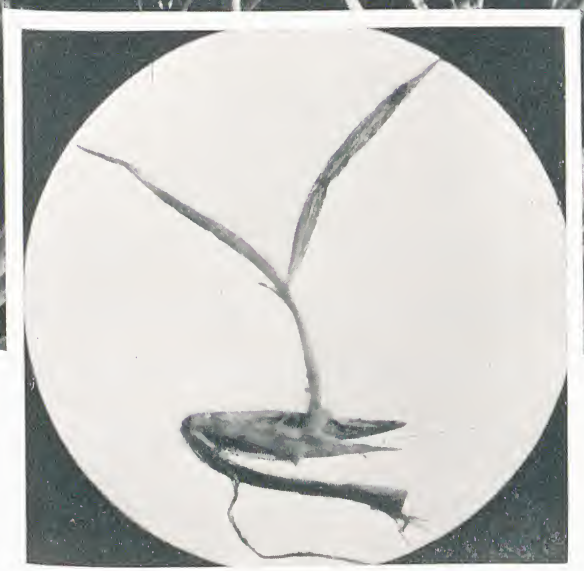
As with any human endeavour involving men and equipment, the quality of the leaders, the organization of the chain of command, and the *esprit de corps* of the "officers and men" have a vital bearing on success or failure.

The managers of the mills are mainly men who have worked for most of their lives in the mill organization. They are responsible not only for the internal running of the mill and its transport system and for the management of 300 to 900 employees but also for the relations with growers, the welfare and training of staff, and the despatch of sugar. The manager has to be a man of clear, analytical mind, firmness and tact. Many of them would have been leaders in any walk of life.

Under the manager, the usual heads of departments in a mill are the field superintendent or senior cane inspector, the chief engineer, the "mill manager", the accountant, the technical field officer, and, in Fiji, the traffic officer. The departmental work of several of these officers has already been described. At a few mills there are additional departmental heads with specialist functions.

The name "mill manager" is at first confusing to the stranger but the history of the name is indicative of one aspect of past growth and change. When chemists were first introduced into the mills, seventy years ago, they were regarded with some degree of suspicion by the managers and engineers of the day, who had been accustomed to judging the efficiency of extraction by tasting the megass for sweetness. The then general manager, Mr E. W. Knox, emphasized their importance by giving them the title "mill managers". The name persists, although in modern phraseology their function is nearer to that of process managers or manufacture superintendents.

Obviously there must be the closest co-operation between the engineers and the "mill manager" and his staff of chemists. Broadly,



A cane seedling two weeks old magnified about five times. Only cane breeders propagate cane from seeds. The commercial grower plants lengths of cut-up cane.

Cane flowers, usually called "arrows". The arrow is actually a group of flowers which, under favourable conditions, produce minute fertile seeds. The cane breeder germinates such seeds in his nursery.

Right: The officer in charge, Mr K. R. Gard, supervises the potting of seedlings at the C.S.R. field experiment station at Macknade, Herbert River, North Queensland. A number of successful commercial canes, including the well known *Trojan* and *Pindar* varieties, have been bred here.

Below: At the C.S.R. cane nursery at Broadwater, N.S.W., where more than 10,000 seedlings a year are raised.

At the C.S.R. cane nursery at Rarawai, Fiji. Both Indian and Fijian assistants are trained in experimental work.

Young seedlings are raised in hothouses and then transferred to glass-frame beds to acclimatize.

Cane seedlings from nurseries are planted in experimental plots. This one is on the Tweed River, northern N.S.W.

The development of every individual seedling in experimental plots is watched and recorded.

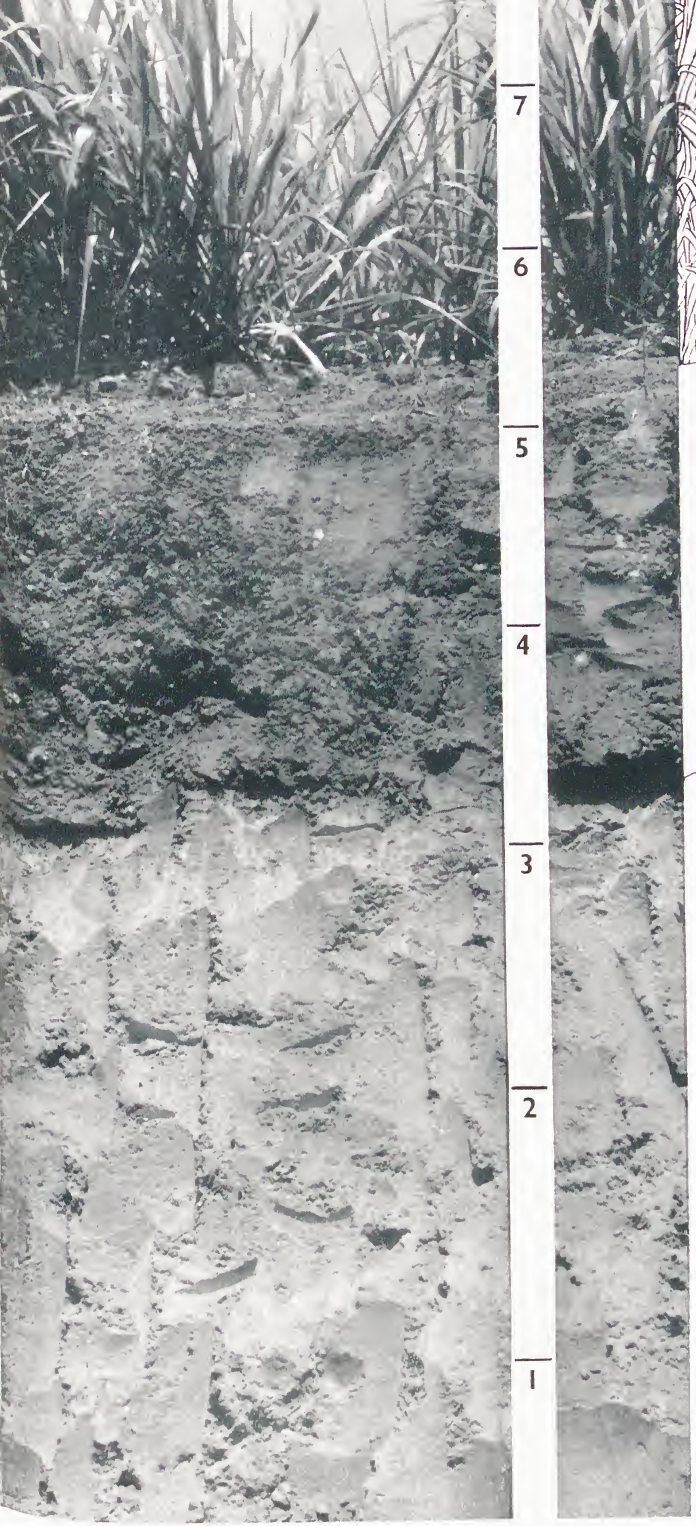
Taking sample of juice from an experimental cane.

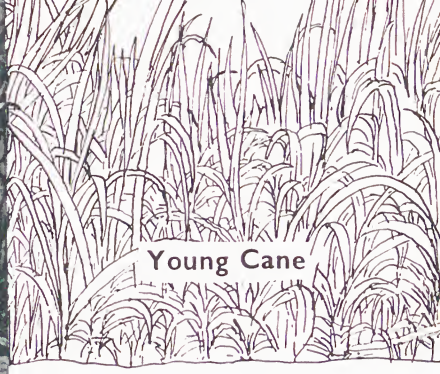
A drop of cane juice is poured on to the plate of a refractometer and the instrument is read. The refractometer measures the percentage of soluble solids in the cane juice, which gives a good indication of its sugar content.

Above: On the left, grub damaged cane. On right, undamaged cane previously treated with benzine hexachloride.

Below: Grubs which eat the roots of cane.

Right: Healthy and diseased cane. The cane on the right has been stunted by Fiji disease. The main method of combating cane diseases is by breeding and growing disease-resistant varieties.





20 inches of
Rich Alluvial Topsoil

3 ft. 4 ins. of Deep Clay
Subsoil to bottom of cutting

Second ratoon cane growing on top of cutting. This profile is fairly typical of alluvial soils in North Queensland. The soils of Australian and Fiji cane land vary from rich valley alluvials such as illustrated above to poorer soils on foothills. The soil above, shown up by a cutting for Hambledon Mill's light railway, yielded 40 tons per acre in 1952 from plant cane, 37 tons per acre in 1953 from first ratoon cane, and 35 tons per acre in 1954 from second ratoon cane.

C.S.R. technical field officer and grower on a cane farm near Innisfail, North Queensland.

Left: A Cairns cane farmer and C.S.R. technical field officer.

Indian cane farmer, Fiji, and company's field officer.

Left: The whole family gather while a company field officer talks to a Fijian farmer.

in respect of the actual process of production, the chief engineer and his staff control the train of milling rollers and the furnaces fed by the megass. The chemical staff is in direct control of the manufacture of sugar from the juice pumped away from the crushing train, and is responsible for all analytical chemical work, on the cane, in the crushing train and throughout the factory. The chemists must sample, measure, analyse and adjust the process to meet ever-changing conditions. A most important part of the chemists' functions is the supervision of the men on processing stations in their part of the factory and of those handling the manufactured sugar.

The chief engineer and his staff have most varied responsibilities. In addition to the milling train, the boiler stations and the power station, there are all the mechanical jobs in the mill, on the conveyors for cane and megass, and the overall maintenance and good order of all the motors, pumps, electrical services and machines. During the slack season, the whole equipment of the mill must be overhauled, new equipment installed and everything made ready for the "crush". When there is a major new installation it must be done before next season; it may be new boilers and furnaces, involving £300,000 to £500,000 in construction work, in addition to the usual overhaul of the whole mill. The "chief" and his staff often aver that the traditional term "slack season" has little meaning.

The engineers have responsibilities, too, in the maintenance of bridges, locomotives and rolling stock, and of the telephone and radiotelephone systems which are used in co-ordinating the transport system. Able, conscientious engineers mean smooth-running mills. The characteristic question of the chief as he enters the mill is "How's the rate?" meaning the tons of cane crushed per hour. Also characteristic is the way even the placid ones explode into action when a mechanical stoppage occurs, as when a piece of "tramp iron" entering with the cane stalks stops the crushing rollers.

The accountants, some located at the mills and some in Sydney, are, as ever, the watchdogs of the money, in the sense that they are expected to seek all avenues by which expense can be reduced and income increased. The chemists and engineers may have failed to recover a little of the sugar but to gain it might have cost more than it was worth because of extra expense on overtime, the employment of more men, or some other factor. The money figures of the accountant are the overall test. The accountants and their staffs make possible the business integration—as distinct from a technical integration—of the work of the different departments, and of the buying, manufacturing and selling. Sound decisions must be based on financial

data. Accurate and speedy, yet quietly efficient, office work, especially in handling payments for cane and wages, helps to encourage harmonious relations between the mill and the growers and employees. At Lautoka, for instance, there are nearly 5,000 growers and 1,000 employees, and keeping their accounts and making payments is in itself a formidable job for the clerical staff. The records and analyses required by governments and modern business are legion. Finally, the profit and loss figures, compiled by the accountants, set the seal on all the efforts of the organization.

"Head office" controls broad policy, manages the sale and sea transport of the raw sugar, and provides finance. In the head office are the two senior officers who control their respective milling divisions, specialist industrial officers, senior factory and field technologists, senior designing and operating engineers, and accountants. These and others play their part in the direction of affairs, by correspondence and by personal visits.

* * *

Since the war, production capacity at C.S.R. mills has been considerably expanded. Annual milling capacity has increased by about 900,000 tons of cane or 125,000 tons of raw sugar—a rise of some 35 per cent. The present rated capacity is 465,000 tons of raw sugar per season, slightly more than the immediate production target. Actual production has reached 438,000 tons, in 1953, although it was less in 1954 owing to seasonal conditions.

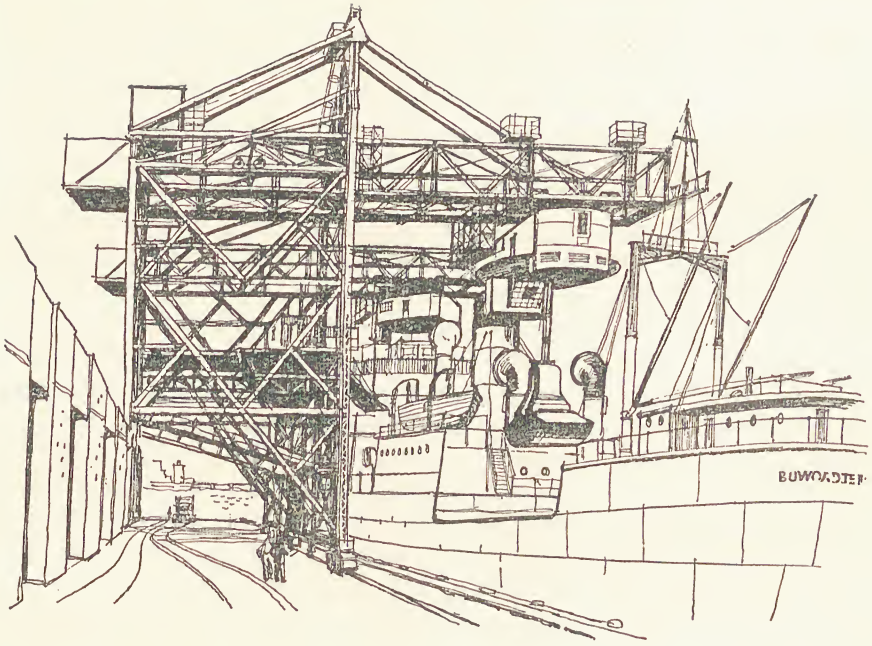
The most striking single instance of expansion is the duplication of Victoria Mill in northern Queensland and the building of 25 miles of tramline to reach and service an entirely new stretch of virgin country known as the Abergowrie area. Where there was before virtually nothing but trees, grass and a few cattle, there are now 10,000 acres of close settlement, a school has been built and a township is growing. The cost to C.S.R., for the expansion of the factory and of the transport system, was almost £3 million. Design and construction were carried out by the company's own engineering staff. From the conception of the plan, which followed immediately the agreement in London on the expansion principles of the British Commonwealth Sugar Agreement, to the start of crushing of the crops grown on the new area, was a period of slightly more than three years. Important developments, impressive in aggregate but not as individually spectacular as Victoria-Abergowrie, have occurred at other C.S.R. mills in Queensland and in Fiji.

In 1954 the gross revenue of all the company's mills from sugar made and sold was £17.4 million. Most of this was disbursed in the cane

districts, thus promoting industry, trade and development there. £11.7 million was paid to the growers for their cane and £2.6 million to the mills' employees. There are many other expenses, not all incurred locally, but local stores and businesses supplied mills with various materials, besides sharing in the trade generated by the expending of the farmers' and employees' incomes.

All this development rests upon the foundation stone of expanded markets—from Australia's increasing population and under the British Commonwealth Sugar Agreement and Empire tariff preference—to feed people in Australia, the United Kingdom, Canada and New Zealand.

This chapter could only deal with the broad outlines of the economic and social edifice: the capital resources supplied by thousands of shareholders, the profit motive, the partnership with nature, the victories of expertise and the places where victory is yet elusive, and the contributions of the captains, as representatives of their teams. There are others, too, with contributions of brain and hand and eye; many have been with C.S.R. most of their working lives, and some had fathers and grandfathers there before them. The intangible ingredients, so important for the best results, are also there—experience and tradition in the organization, with enthusiasm and teamwork from individuals.



CHAPTER 7

Sugar Marketing Operations

J. M. DIXON

The structure or general framework of the market situation has already been described, but little has been said of the manner in which selling, shipping, financing and all other commercial aspects of marketing are carried out inside the general framework. These functions have rarely been described except by and for the specialists concerned with them. They are the essential link, however, providing the customers with what they want and C.S.R. and the sugar industry with their income. In this chapter Mr Dixon gives many details which are not widely known. There is a special interest in this account because, in the South Pacific countries, over 98 per cent of all sugar, whether raw or refined, is marketed by C.S.R.

This chapter also touches on rates of sugar consumption in various countries and on the methods of marketing and distribution which aim to keep costs low in order to retain cheap prices to the consumer.

September 1955

The successful selling of the end product ultimately determines the prosperity of everyone in the industry. If it is not sold successfully, all the efforts of farmers, millers and refiners, with their employees and the host of businesses which supply and service them, will suffer. The final customers are children buying sweets or soft drinks, men buying their beer and, most importantly, millions of housewives buying not only their four pounds of sugar and tin of golden syrup but also the tin of jam, the bottle of sauce or the packet of biscuits which could not have been made without sugar.

These customers will rarely, if ever, give a thought to how the sugar is there to meet their needs. But in the background is the story of a large and intricate, yet systematic, organization of shipping, insurance, finance and many other aspects of commerce. There are experts working on ways of reducing transport and other costs, and advertising and market research men studying customers and estimating market trends. As with many other bulk commodities entering international trade, there is a background of international conferences and agreements, of politics and government intervention, and there is an important area where buyer and seller still carry on their age-old commercial bargaining.

C.S.R. carries out most of the work for the marketing of sugar produced in the South Pacific—for export to overseas markets of raw sugar from Australia and Fiji, for the purchase of supplies of raw sugar for New Zealand, and for the sale of refined sugar in Australia and New Zealand. In its early days in Australia the company was a buyer of raw sugar from remote countries, and in its New Zealand refining business it is still so. Today it has become one of the world's big sellers of raw sugar. Further, it has markets close at hand—the domestic Australian market for refined sugar, which has been its most important market for a century, and the New Zealand home market, which has been an important market for over seventy years.

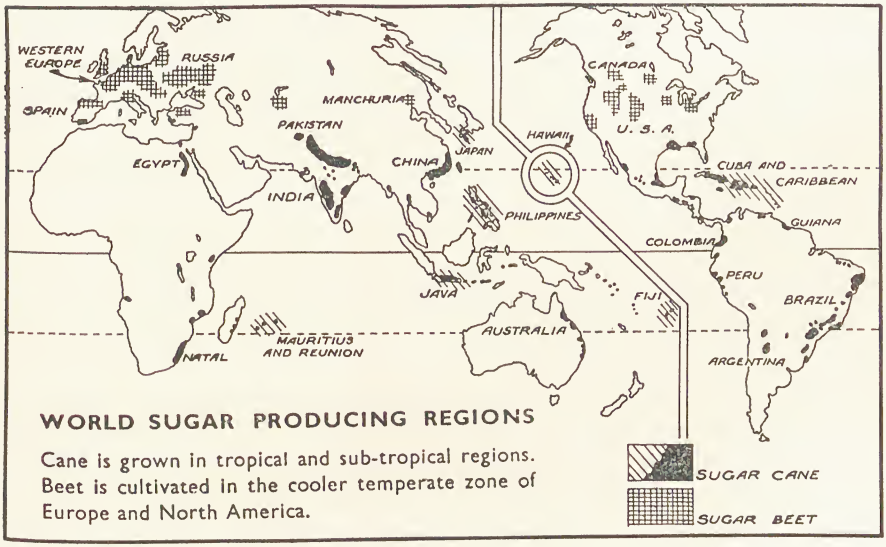
In the financial year ended on 31 March 1955 the company marketed, in a wide range of places, under very different conditions and in varying types of markets, 1,404,381 tons of sugar and refined sugar products, in the following categories:

From its refineries in Australia	*486,852 tons*
From its refinery in New Zealand	*97,263* ,,
Exported as raw sugar from Australia ...	*681,808* ,,
Exported as raw sugar from Fiji	*126,745* ,,
Consumed in Fiji	*11,713* ,,
	1,404,381 tons

The total value of these sales, expressed in Australian currency, was approximately £79 million. Compared with the immediate prewar period there has been an increase of about 50 per cent in tonnage and 300 per cent in value.

Raw sugar exports from Australia and Fiji come under the British Commonwealth Sugar Agreement (B.C.S.A.) and the International Sugar Agreement (I.S.A.) as previously described. These agreements and the home consumption market in Australia provide price umbrellas which are as useful as most umbrellas are. They restrict movement a little and can be clumsy to handle. They give no protection if one bulges out and, unless wide awake, one can still get wet feet. Otherwise they are excellent, unless the economic storm gets violent. They confer some protection from bad economic weather but none from internal inefficiency. They leave solid compulsions to know one's markets and customers and to minimize costs.

In view of the description already given of these agreements and of the part played by the company's officers in bringing them about they need only be touched on here. It will be recalled that under B.C.S.A. the price for half of Australia's exports and three-quarters of Fiji's exports is negotiated annually on the basis of reasonable remuneration to efficient producers. The marketing of the rest of the export raws—other than the "negotiated price" quantity—goes on almost throughout the year. The foundation of the price is the free



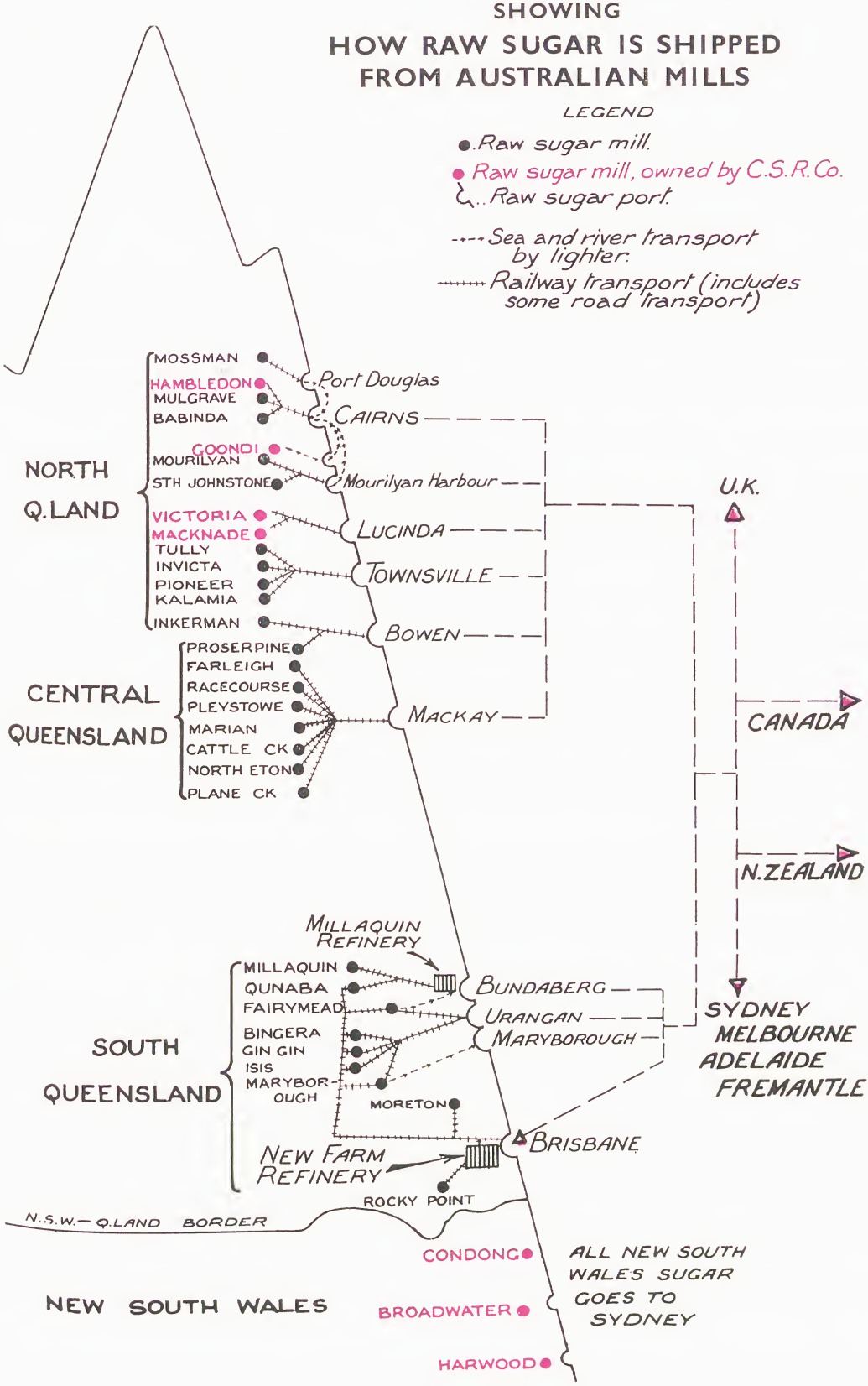
market or "world price". It changes daily and, while generally depressed by pressure of supplies, it is in many respects typical of other open markets. Reports of crop size or rumour about the intentions of the International Sugar Council affect it. Gossip, especially of the intentions of the biggest seller, Cuba, and of big buyers, is rife. Like all such international bazaars it is no place for the uninformed or the unalert to operate. As to the quality of the goods, credit worthiness and performance of contract—vital matters in clinching a deal on the market—the reputation of the buyer or seller, as the case may be, is most important. Many of the world's producers put up their wares for sale; the buyers (who are the refiners and include C.S.R., for New Zealand), through daily market information, letters, cables and brokers' services, do their shopping from many corners of the world. The centres of this market are Mincing Lane in London and the Coffee and Sugar Exchange in New York. Sellers of good standing, who can offer sound quality and the best delivery service, have the best chance of making good sales.

The Sugar Marketing Division of the company handles most of the selling, transport and shipping arrangements from the head office; but much of the refined sugar is sold through branches of that division located wherever there are C.S.R. refineries. The company has its Representative in London to assist with the sale of export raw sugar from Australia and Fiji by maintaining close co-operation with shipping brokers and sugar brokers and by contact with customers, fellow sellers, and the Colonial Office.

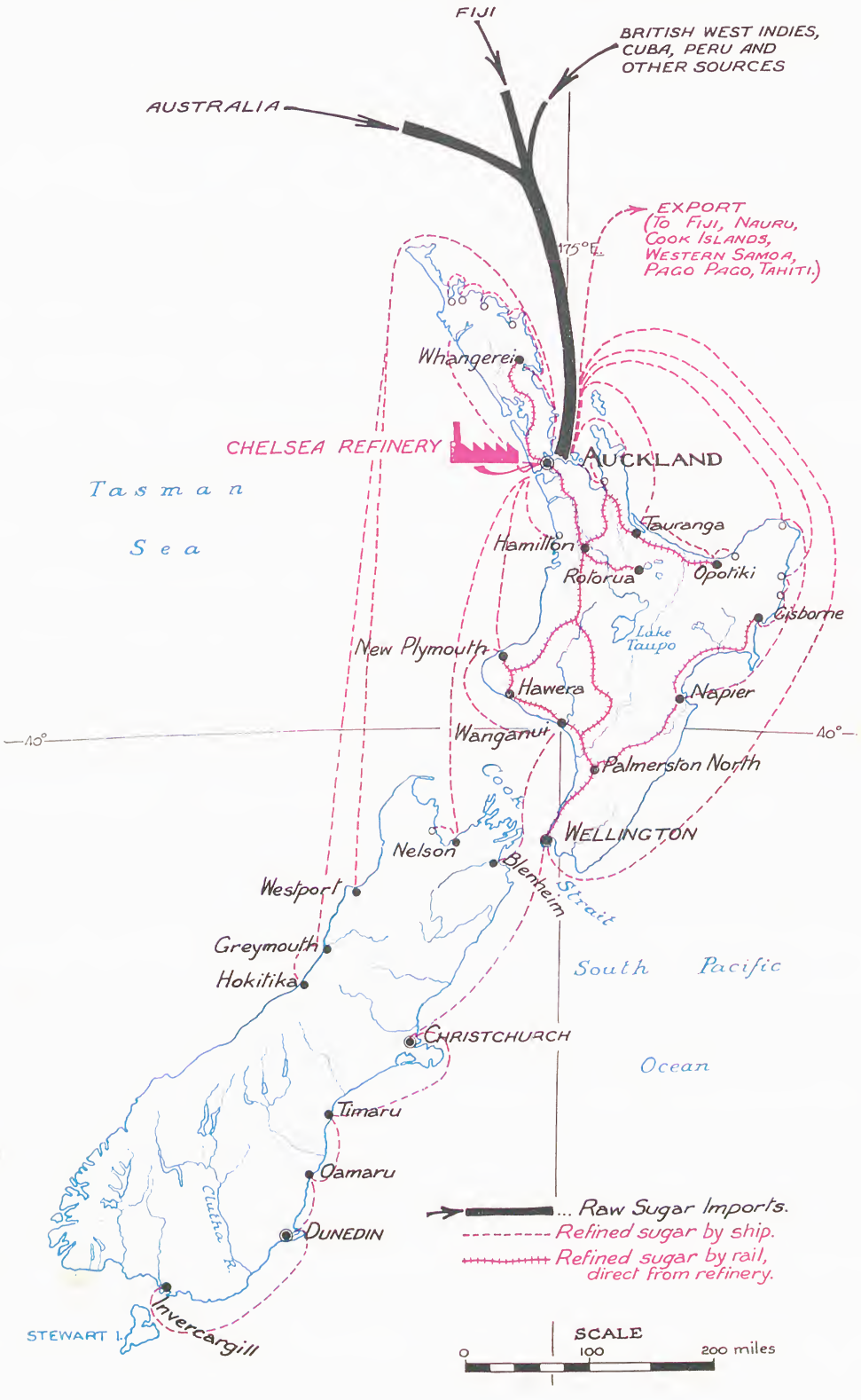
The company does not make any profit directly from its marketing work. If it made a profit of $2\frac{1}{2}$ per cent on sugar sales turnover, the result would be a sum greater than the total profits from all other activities—milling, refining and other business apart from sugar. In practice, the marketing of the Australian crop, both raw for export and refined in Australia, is done under the contract with the Queensland Sugar Board. The company's incentive lies in its interest in that contract as a whole, in its knowledge that an unprosperous Australian sugar industry means an unprosperous C.S.R., in the tradition of responsibility for functions carried on for so long, and in the fact that its own mills make one-fifth of the Australian raw sugar sold; it is selling its own raws in the common pool with the rest.

In Fiji, the raw sugar manufactured by the company is marketed to the best advantage. In New Zealand, the incentives to buy raws well, to transport them cheaply and to minimize all distribution costs are similar to those normally found in manufacturing business in that country.

SCHEMATIC DIAGRAM
SHOWING
HOW RAW SUGAR IS SHIPPED FROM AUSTRALIAN MILLS



SOURCES OF RAW SUGAR SUPPLY AND REFINED SUGAR DISTRIBUTION IN NEW ZEALAND



The Marketing Pool in Australia

All raw sugar produced at Australian mills, whether it is to be exported or refined for consumption in Australia, is placed in the marketing pool under the jurisdiction of the Queensland Sugar Board. The Queensland raws, including those made at C.S.R. Queensland mills, are compulsorily acquired under statutory powers and the New South Wales raws are purchased from C.S.R. by agreement.

The Sugar Board, having become the legal owner of the sugar, makes contracts, re-negotiated annually, with the two Australian refining companies for the whole of the handling, selling, refining and financing of the pool's raw sugar. The Millaquin Sugar Company Limited handles about 25,000 tons, which is refined at Bundaberg, and supplies about one-third of Queensland's requirements. The remainder comes under the contract with C.S.R.

Under this contract, the company arranges shipping to supply its own refineries, sells the surplus sugar abroad and arranges all the required export shipping, refines Australia's requirements (except for the Millaquin quantity), sells the refined sugar and other sugar products in Australia, and finances the whole operation. The whole of the work is in the nature of a contract for services supplied, and in much of it C.S.R. is acting as agent for the Sugar Board.

The company attends to all the detailed arrangements such as marine, fire and flood insurance, and the obtaining of payment from overseas buyers. There is the specialized and difficult matter of arranging shipments to suit storage at mills, ports and refineries. There is the financing of the crop by cash advances to the mills as raw sugar is shipped; the interim and final payments to the mills after the disposal of most of the crop and the meeting of expenses; and the final accounting.

In all this work the Sugar Marketing Division is closely associated with various other functions of the company, such as insurance, central accounting, and the purchasing of jute bags. This division of the company also procures the raw sugar for New Zealand, markets the refined sugar there, and markets the export raws from Fiji. The company's sugar selling organizations at its branches in Australian mainland capital cities and in Auckland operate as parts of the whole Sugar Marketing Division.

For the 1954 season the quantity of Australian sugar handled for the pool by the company for home consumption (refined) and export (raw) was 1,257,500 tons and the sale proceeds were £64.6 million. In this work the company recovers its expenses and is paid management, financing and selling fees per ton of sugar sold in Australia.

In evidence to the Sugar Inquiry Committee in 1952, the company submitted detailed information showing that the management, financing and selling fees collected on *home consumption* sugar amounted to £2 7*s* 10*d* per ton out of the then total retail value of sugar and bags of £78 5*s* 4*d*. The company does not make any profit from the management services and expertise employed in the marketing of Australia's *export* sugar.

Selling the Export Raws

The first consideration in selling the export raws is the performance by Australia and Fiji of their long-term contracts to supply the United Kingdom and New Zealand with sugar at the "negotiated price". The balance of the export sugar is called "free sugar" and can be marketed anywhere. Tariff preferences in Canada and the United Kingdom pull most of Australia's free sugar to those countries, although it still has to compete with other preferential sellers—the British West Indies, South Africa and Mauritius.

Shipment of the export raw sugar must conform, within reasonable limits, to a month-by-month pattern set by the rate of production and the availability of storage space. Shipments must also conform to the calendar year quotas imposed by the International Sugar Agreement; this factor causes considerable difficulty, as the international quota year ends in December, which here in the southern hemisphere is a period of heavy shipping just after the finish of crushing. Unsold sugar is not shipped so that sales must be made well in advance, taking the foregoing considerations, and others, into account.

In addition to selling free market sugar to the United Kingdom, Canada, and New Zealand, sales have recently been made to Japan, Hong Kong, Malaya and Ceylon. These peacetime sales to Asian markets are a new development.

The great volume of sugar for shipment presses heavily on port loading facilities and it is usual for sales to be made on a c.i.f. basis, so that the price to the buyer includes freight and insurance to destination. Under this arrangement, the company engages the freight and this allows the flow of shipping to be better organized than would otherwise be possible.

It is usual practice to hold a firm offer of freight (an option on a vessel with all conditions specified, including quantity, freight rate and approximate time of loading) before making an offer of sugar to a buyer. Dealings in freight are almost entirely with individual shipowners for individual cargo lots in tramp vessels. For the most part,

C.S.R. negotiations with shipowners are conducted through Elder Smith and Company, chartering brokers operating on the Baltic Shipping Exchange in London. This exchange is the world's great shipping freight market-place and almost all important shipowners are represented there. The brokers, armed with a knowledge of the company's broad plans, attend daily on the Baltic, even if no business is in immediate prospect, to keep in touch with shipowners and other brokers and learn what ships may be interested in sugar from the Pacific. The rate of freight is negotiated, often after much haggling, on each occasion of chartering a ship; it fluctuates according to the general balance of supply and demand on the freight market, owners' expectations and attitudes, including their reaction to the state of affairs on the Australian waterfront, the availability of other cargo in the Pacific, and other factors. The freight rate is naturally most important and its relation to freight rates obtainable by other sellers in other parts of the world often determines whether or not business is possible. Dealings with overseas refiners are conducted in the main through the long-established London sugar broking house of C. Czarnikow Limited.

A typical sale might start with a cable from Czarnikow in, say, April advising that a Montreal refiner is in the market for a full cargo, about 8,000 tons, to arrive in the second half of September.

The first step is to get a freight option on a tramp vessel that is working, or can work, towards Australia and is willing to load sugar and go to eastern Canada, probably via the Panama Canal. She may be carrying an inward cargo of motor cars to discharge at Melbourne, or sulphur from the Mexican Gulf for Port Kembla, and can be ready to load in Queensland about mid-July. The freight rate is a critical point and the vessel has to be insurable as a first-class risk.

The next step is to decide an offering price, taking into account all the cost and market factors such as the current (Cuban) "world price," the value of the tariff preference, freight rates from Cuba to Montreal, the buyer's probable idea of price, what prices competitors are likely to be quoting, what could be obtained if the cargo were sold elsewhere. Always there is the market judgment in the background. An offer based on all these considerations will be cabled, frequently within one or two days. Meantime other sellers are making their offers. Sometimes the freight option expires before the buyers are ready to decide. More often than not, no sale will result from a single negotiation and the whole process will be repeated, even many times, until a sale results or one party does a deal in another direction.

If agreement is reached with the buyer, the option over the ship

is exercised and both freight contracts and sugar sale contracts are signed. Insurances have to be effected, the ship has to be fitted into the loading programme with all the other ships. Invoices, bills of lading and insurance policies are made out. The voyage takes some fifty days, the sugar is unloaded and the buyer makes a substantial payment. The final exact weight and quality of the sugar are determined at destination by previously agreed methods. Finally, account sales are prepared and full payment is received months after loading started and generally several more months after the sale negotiations took place.

From Edward Knox's early days, dealing in the sugar markets, as buyer first and later as both buyer and seller, has been an important part of the business. The atmosphere of traditional association with the sugar market fosters the development of market sense in individuals; less tangible elements help, such as company reputation, experience and records, and "talking shop" inside the company and with overseas sugar organizations. All this tends to institutionalize the desired blend of aptitudes, knowledge, and experience, and to produce a leavening of market intuition.

To move the 1954 export crop from Australia and Fiji required no fewer than 143 shipments, mostly full cargoes, quite apart from almost a like amount of shipping to take the raw sugar from Queensland ports to Australian refineries.

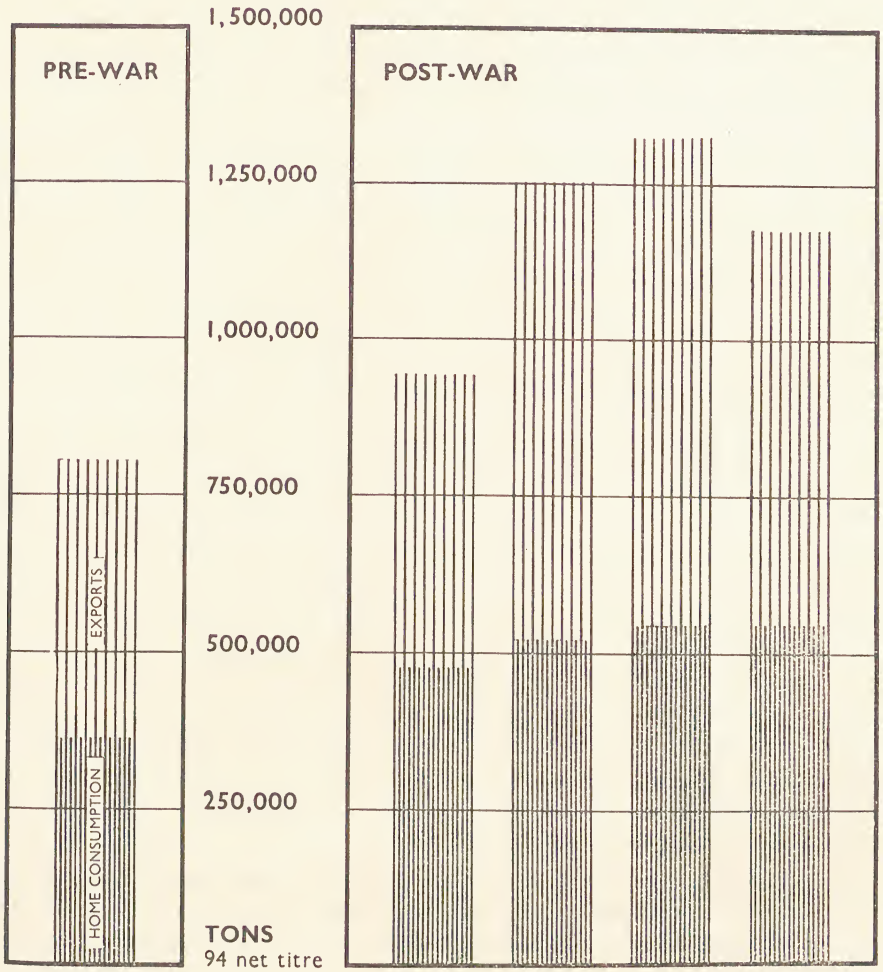
There are few companies in the world which market more raw sugar. The normal tonnage of export sugar from Australia and Fiji amounts to 770,000 tons a year and represents about one-third of the total exports from the British Commonwealth countries. C.S.R. is well-known in the United Kingdom, Canada, most other parts of the British Commonwealth, and also around the Pacific and Indian Oceans. Senior sugar marketing officers make frequent visits abroad to make personal contacts, especially with shipping brokers, sugar brokers, the big British refiners and buyers (Tate & Lyle Limited), the British Ministry of Food, the four Canadian refiners, and sellers from Mauritius, South Africa, and the British West Indies.

Shipping the Raws

Some of the problems connected with the movement of sugar are similar to those found with the movement of other bulk commodities, such as wheat. Wool is not comparable, its quantity being too small. There is the necessity to avoid congestion at ports and to obtain the quickest possible turn-round of ships as a factor in keeping down freight charges. The depth of water available at certain ports and

MARKETS FOR AUSTRALIAN RAW SUGAR

Production has expanded to satisfy increasing consumption in Australia and higher quotas for export. Exports have exceeded quotas in recent years because other exporting countries fell short of their quotas. *Source: C.S.R. records.*



PRE-WAR average 1936-37-38		1952	1953	1954	1955
		Seasons			
362,572	HOME	477,481	521,800	542,742	545,000
442,151	EXPORT	471,008	732,064	783,667	626,000
804,723	**TOTAL**	**948,489**	**1,253,864**	**1,326,409**	**1,171,000**

the length of ships has to be considered in arranging the loading programme. Many factors, such as a vessel's next commitments, have to be allowed for in allotting her for discharge or loading at ports of fast or slow turn-round. These are the normal, although quite involved, matters to be considered in such major shipping programmes.

There are also special factors in the case of sugar. For example, the mills are paid a major proportion of the value of their sugar as it is shipped. In order that each mill will share equitably in these financial advances, shipments have to be spread, according to a formula, not only between different ports but also between the mills shipping through the same port. Again, the sugar has to be kept moving fast enough to avoid stoppages of the mills and of the cane harvesting arrangements because of overfull stores. Supplies must be kept up to the Australian refineries and contracts have to be filled with overseas buyers who have ordered particular quantities within particular times. The quota under the International Sugar Agreement must be shipped in the quota year. The quota cannot be exceeded but if it is not filled the deficiency is lost and cannot be recovered.

In recent years shipping has been made far more difficult by the industrial troubles and the increase in handling time and costs on the Australian waterfront. These conditions have increased costs and have made it more difficult to obtain the necessary ships and load them fast enough to keep the sugar moving out of the congested Queensland ports. Before the war it was possible to move all the sugar in about seven months. Nowadays it takes the best part of twelve months, and sometimes more, to move the crop. With all the stores full at the end of the milling season about Christmas, there is continuing anxiety to obtain the shipping and to empty the stores before the mills start again in June.

Owing to port and labour conditions, crew troubles and delays from bad weather, cargo ships do not run to timetable. Vessels commonly arrive at sugar ports later than forecast. Very often the whole or a large part of the shipping programme covering many ports and vessels has to be rearranged at, literally, an hour's notice; and there may be a dozen sugar ships in or travelling between Queensland ports at one time, with as many as three in some individual ports.

The shipping of raw sugar from Fiji is an onerous enough responsibility but, thanks to satisfactory stevedoring work and good relations between waterside labour and employers, the problem of removing the sugar has not often been acute. When difficulties have occurred, they have been caused by delays to ships in Australia and New Zealand en route to Fiji.

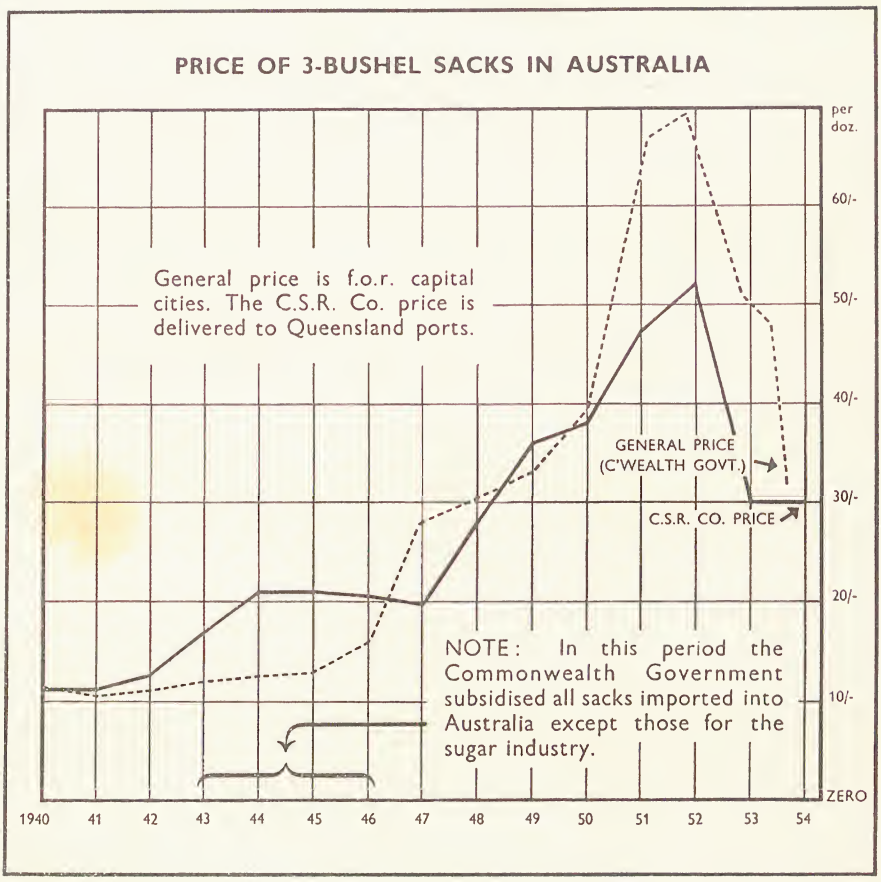
Sugar Packages

Sugar, both raw and refined, is packed in jute bags for storage and transport, although the need for this packing is decreasing with the introduction of bulk handling methods and liquid refined sugar. In one year C.S.R. uses in Australia and New Zealand 12.7 million bags, each holding 70 lbs. of refined sugar. In addition last year 17.5 million 3-bushel bags were supplied to Australian mills for the packing of their raw sugar, without direct charge to the mills, as part of the contract with the Sugar Board. In eight out of the last nine years this has been done at a cheaper price than the general price operating throughout Australia for wheat bags. Sugar bags are the same size and of the same or superior quality, yet in 1951, for instance, the price was 28 per cent less than for wheat bags. The company does its own buying through experienced channels on the tricky Calcutta jute market.

Since jute is available only from India and supplies could possibly be interrupted, safeguarding stocks have to be carried. And packages are an expensive item in sugar industries, as can be seen from the actual figure for 1951, before bulk raw sugar handling had made progress and when jute prices were higher than now, when C.S.R. spent £4.5 million on jute goods. This covered Australia, Fiji and New Zealand for sacks for raw sugar and for hessian for the familiar 70-lb. refined-sugar bag, which later is generally used for scores of domestic and commercial purposes.

Bulk Handling of Raw Sugar

Bulk handling of loose raw sugar is the main action within the power of the industry to combat the high costs of packaging, handling and shipping raw sugar—about four times the prewar costs. Mr Herbert has dealt with the general economic aspects of this. Raws are now being handled in bulk at two of the company's mills in northern New South Wales; Pyrmont refinery has been equipped to unload and store bulk raws at a cost, so far, of £800,000; the Melbourne refinery is receiving in bulk on a less mechanized basis; work is advancing well on Mackay Harbour loading facilities and a start was made on the Lucinda project in 1955. Until these mechanical bulk loading installations are ready, bulk sugar will be loaded by emptying the bags into the holds. Raw sugar presents considerable difficulties in bulk handling because it is sticky and will not flow like wheat; under some conditions it compacts into masses; it is liable to deterioration; it must be protected from rain and dampness at all times; and



it has a high value and spillage losses would therefore be costly—to a far greater degree than with coal, iron ore, rock phosphate and several other bulk commodities.

Very detailed and expert engineering and economic investigation is needed well in advance to determine the best methods, especially for the purpose of gaining the maximum advantages from the heavy capital expenditure. The whole world was searched and bulk handling of many commodities was investigated before decisions were made. The company's recent report on its overall bulk plan and its recommendations for the Australian industry said:

> Handling raw sugar in loose bulk instead of in bags and doing this in a semi-automatic way should be looked upon as a means of reducing costs, improving co-ordination and control of raw sugar transport, eliminating the arduousness of the work of man-

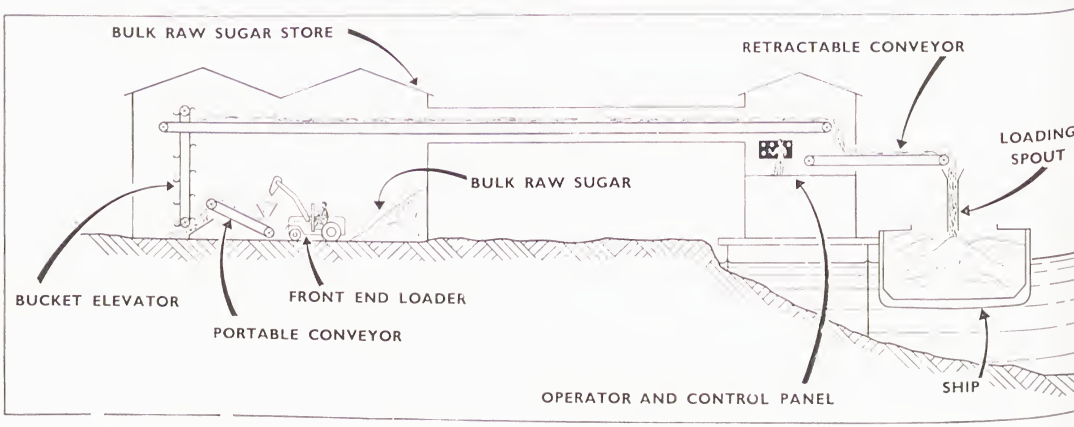
Raw sugar from Babinda co-operative mill at the port of Cairns. Most Queensland mills rail their sugar to the nearest port, where it is loaded by slings for shipment to refineries. Sugar from a few mills goes by lighter to the main port. Installations are planned at Queensland ports (some are under construction) for storing and loading raw sugar in bulk, instead of in bags.

Left: Stevedore-foreman and C.S.R. wharf officer at Lautoka.

Below: Raw sugar being shunted to the C.S.R. Co.'s wharf, Lautoka Mill, Fiji, for shipment overseas.

A mechanical thrower piling raw sugar from the mill process on the floor of the bulk store at the company's Harwood Mill on the Clarence River, N.S.W.

Front-end loaders load loose raw sugar from the bulk store onto a series of conveyor-belts which drop it into the hold of a ship.



Method of loading raw sugar in bulk at Harwood Mill.

Overseas ship discharging raw sugar at Auckland refinery, New Zealand.

Bagged raw sugar in refinery store.

Control panel for belt conveyor system handling bulk raw sugar at Pyrmont refinery.

One of two large cranes at Pyrmont refinery used for unloading raw sugar in bulk. The grabs bite about 4 tons of sugar.

Delivering refined sugar in 70 lb. hessian bags from the refinery to grocers. About half the sugar consumed in Australia is sold through grocers. The other half is used by food and beverage manufacturers.

C.S.R. golden syrup on sale in an Auckland self-service store.

Bulk delivery of liquid refined sugar, Sydney.

Large quantities of sugar are used by the jam making and fruit preserving industry. *Photograph by courtesy of Leeton Co-operative Cannery Ltd.*

The C.S.R. Company's stand at the Royal Easter Show, Sydney, is always popular with children, who receive a wisp of fairy floss (spun sugar) on a stick of sugar cane.

Sugar — an energy food — accounts for a large part of the caloric content of the diets of advanced communities.

Opposite page: An example of the advertisements inserted by the C.S.R. Company in metropolitan daily papers and national women's magazines in Australia.

Sugar and spice and all things nice

Children love sweet things. The delights of the confectionery shop are one of the most enjoyable experiences of childhood. When we grow up we associate sweet things with pleasant ideas—we talk about a sweet child or a sweet disposition. Children need plenty of food to build their growing bodies and to provide the energy they use up in play and sport. Foods which contain cane sugar are particularly rich in energy, and play an important part in a good all-round diet.

Your grocer sells C.S.R. loaf sugar in a handy 2-lb. packet.

Tropic Sunshine

Sugar, one of our most important foods, is made by the sun's rays shining on the green leaves of the cane plant in Australia's tropic north. The sugar is stored as sweet juice in the cane stalk.

Over 9,000 independent farmers grow Australia's cane. The juice is crushed out at 34 mills (C.S.R. owns 7) and made into raw sugar. The sugar your grocer sells is refined from this raw or crude product. C.S.R. owns five of the six Australian refineries.

THE COLONIAL SUGAR REFINING COMPANY LIMITED

Sydney • Melbourne • Brisbane • Adelaide • Perth

Signing the British Commonwealth Sugar Agreement in 1951 at the Food Ministry's Headquarters in Horseferry Road, London. The late Sir Albert Feavearyear, of the Food Ministry, shows the late Mr H. R. F. Watson of the C.S.R. Company (representing Fiji) where to sign. The Minister of Food, Major the Rt. Hon. Gwilym Lloyd George, M.P., on the right. Standing round the table *from the left:* Sir Thomas White, Australian High Commissioner in London, Mr G. M. Eccles of the British West Indies, Mr H. R. P. A. Kotzenburg, Mr D. A. Donelan, and Mr R. M. P. Heyneke, South African representatives, Mr J. M. Dixon of the C.S.R. Company, and Sir Philippe Raffray of Mauritius. *British Official Photograph.*

handling bags, and improving working conditions. It is essentially a transfer of work from men to machines and vastly improves the speed of flow of the sugar. It requires very high capital expenditure and there must be full control, and carefully co-ordinated control, of all the operations, from mill to refinery, in order to get sufficient advantages in the shape of lowered working expenses to justify the high costs associated with the capital: maintenance, depreciation, redemption, and profit or interest on the funds employed.

The main reductions in working expenses are to be found in the elimination of the jute bag, the reduction in the number of men employed and in the quicker turn-round of ships, which will enable one ship to transport much more sugar per year than the same size of ship can transport by existing methods.

Financing the Sugar

Sugar is paid for at the approximate time when it is delivered to the customer, whether it be delivery of refined to grocers and food manufacturers or delivery of raw sugar on discharge from ships at overseas refineries. Obviously, a great deal of money is expended on the sugar before then, in payments to the mills for the raw sugar and in transport expenses, bags, refining, and so forth. These payments amount to a considerable total and large sums are always outstanding. Money required for such purposes is called the "working capital" of business, as distinct from the "fixed capital" invested in land, buildings and plant. In the business done by C.S.R. for the Australian sugar marketing pool the maximum amount outstanding at any one time (outlaid but not yet recovered in sale proceeds) has amounted to as much as £15.4 million and recently has varied between £12 million and £5 million. This can be looked upon as the Sugar Board's overdraft with C.S.R. In addition, of course, the company requires further large sums of working capital for Fiji, for New Zealand and for all other parts of its business.

The system of advances to the Australian mills is a very liberal one, and they require less working capital than any similar large business which is comparable. In particular, they require much less than the Fiji mills which make similarly heavy payments for cane as crushed, meet the manufacturing expenses, and often carry sugar stocks for many months. All these outgoings are only recouped by the company months later when the customers in Australia and the overseas refiners pay for the sugar as it is delivered to them.

The Chairman of the Sugar Board, Mr P. J. Donnollan, has pointed out that the Australian raw sugar producers (growers and millers) are more fortunate as regards finance than some other major primary industries, in that they receive a high proportion of the proceeds soon after delivery of the cane or manufacture of sugar and a final payment before the next season starts, although many million pounds of the season's proceeds are still tied up in sugar in stock and in transit. Mr Donnollan has remarked that, while millers have praised the system, it has operated in an effective delay-free way that tends to cause it to be taken for granted. And he adds, "C.S.R. is the principal contributor to this satisfactory state of affairs; this is an important service performed by the company for the industry."

Marketing Refined Sugar in Australia

Refined sugar is one of our most common foods, as usual on the table as salt, appearing on every housewife's grocery order, and essential in a vast range of manufactured foods and drinks. Although we think of it as it appears in the sugar bowl on the table or in the canister on the kitchen shelf, it is manufactured and used in quite a variety of forms. Because it appears in every household's budget, its cost and the method of marketing are of interest to all.

93 per cent of all refined sugar sold in Australia is in the highest quality granulated form, with only about one part in a thousand not pure sucrose. There are two grades: 1A, which is graded for size of crystal and is primarily for the household; and 1XD, which is intended for dissolving, mixing and grinding by manufacturers and is not graded.

Other familiar refined sugar products are brown sugar, used on porridge and breakfast foods, loaf sugar, caster sugar and icing sugar. Additional "fancy" grades are sold in small quantities, including "coffee crystals", the large brownish crystals which are asked for widely but in small purchases. The demand for coffee crystals is quite small in total tonnage—perhaps 300 tons a year in a total refinery production of 580,000 tons—but they are now being made again because of numerous requests.

Most of these refined sugar products have been familiar objects of everyday sight and enjoyment since childhood. No one seems to know when or where golden syrup was christened "Cocky's Joy"—but to Australians the association is obvious. Many people remember it as a regular part of their diet, on steam puddings, on pancakes, on "puftaloons" (fried scones), or simply on bread.

Apparently Australia eats more sugar per head than any other nation. This is consistent with the results found by statisticians and market analysts who have sought to devise ways of forecasting sugar consumption, investigations which are of major interest in planning C.S.R. factory capacity for several years ahead. Sugar consumption is largely related to the level of national income and to the degree of equality of income through the population, and in these respects Australia holds a high position. It is also influenced by the price of sugar and, as Mr Herbert has pointed out, Australians are well situated, compared with other countries, in the price they pay for sugar. Climate, national tastes and food habits are also important. These factors underlie the high average annual consumption in Australia of about 118 lbs. New Zealanders, too, are good sugar customers, consuming about 103 lbs. per head.

The wide disparities in sugar consumption per head, the connection between high living standards and sugar consumption, and the scope for increasing total world consumption are indicated by the latest available figures for pounds consumed per head per year:

Australia	*118*	*Belgium* ...	*61*
United Kingdom ...	*112*	*Mexico*	*56*
Sweden	*109*	*France*	*55*
Canada	*104*	*Italy*	*34*
New Zealand	*103*	*Japan*	*24*
United States	*92*	*Turkey*	*18*

(*Sources: Australia and New Zealand—C.S.R. United Kingdom—estimated by Ministry of Food, 1955. Others—International Sugar Council*).

Sugar and Dental Decay

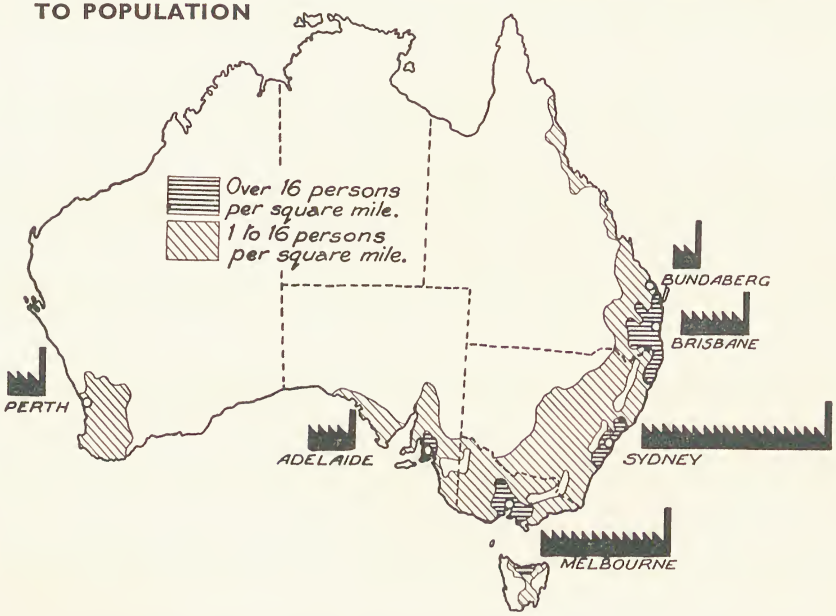
The company does not enter into the controversial topic of dental decay and its possible relation to high sugar consumption. It holds to the opinion, however, that the issue should not be pre-judged on the incomplete evidence at present available. C.S.R. officers keep themselves informed on the latest professional work and opinion about dental caries and they are fully aware that there is presumptive evidence against sugar. Adequate control of dietary experiments is difficult, however, and purely circumstantial evidence can hardly be regarded as conclusive.

The appetite for sugar seems to be a natural one, gratified fully by people who can afford it. Sugar is wholesome and pleasant; and it provides a necessity for the human system, important especially as an

in the world; that is, at the landed equivalent of the "world price". As this is written this involves a reduction of £17 2*s* 0*d* per ton from the standard price of £72 for refined sugar. There is also a special discount of £2 4*s* 0*d* per ton for sugar used in canned fruit and jam for domestic sale inside Australia, to assist the fruit growers and processors.

This arrangement covering exported goods containing sugar is not subsidization. It is a fair arrangement placing the manufacturers in the same position as if they imported the sugar, manufactured in bond and subsequently re-exported the sugar in their goods. Despite this arrangement costs in Australia for fruit, milk, tinplate and labour have gone so high that these industries are experiencing difficulties in their overseas markets. South African manufacturers, who have very cheap sugar (below "world price") as well as cheap labour and other low costs, are tough competitors for our exporters of processed

LOCATION OF AUSTRALIAN SUGAR REFINERIES IN RELATION TO POPULATION



Australian refineries are situated in the main centres of population, close to most of the people who buy sugar. The size of the refinery symbols indicates approximately the proportionate amount of sugar refined at each. The refinery at Bundaberg is owned by the Millaquin Sugar Company. The other five are owned by C.S.R.

fruit. The loss of overseas markets by the Australian exporters is a loss, too, for the sugar industry and, indeed, for Australia.

Economy in Distribution of Refined Sugar

The wholesale merchants have to maintain selling staffs for their large general business with retailers. Selling refined sugar through approved wholesalers, who number only 106 for the whole of Australia, avoids the expense of a large selling and distribution staff for sugar, which would be needed if dealings were direct with thousands of retailers.

Economy in distribution is greatly assisted also by the big proportion which is delivered direct from the refineries to the retail shop or food manufacturer. While practically all *orders* from retailers go through the wholesale houses, just over 50 per cent of *deliveries* is nevertheless made direct from the refineries to the retail shops and factories. A further 30 per cent is delivered from the refineries direct to wharves and to rail trucks for country areas. The proportion of deliveries direct from factory to user or retailer is probably higher than can be found with any other major foodstuff. It has great advantages. It saves multiple handling costs and gives speedy service, often several deliveries a week. It provides the freshest possible sugar and reduces the losses by leaks, contamination, and vermin. Stocks carried by grocers and factories, and therefore the expense to them of storage, finance and handling, are kept down.

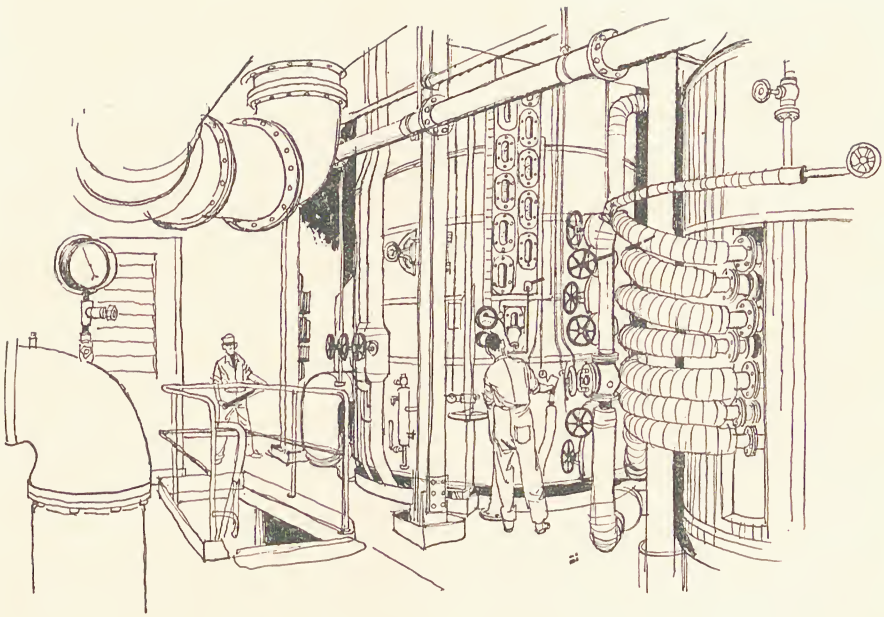
This valuable economy in distribution is largely made possible by the high concentration of population and food-processing industries in the Australian capital cities and by the existence of C.S.R. refineries in all capital cities except Hobart. Even in Hobart the sugar is supplied at the same price as in the other capitals.

The refineries are important as the commercial reservoir of sugar ready for consumption within quick delivery range of the customers. They also provide strategic or safeguarding reserves of sugar, which all over the world are found essential where large populations of consumers are a long way from the cane fields and raw sugar mills.

Advertising costs represent a major factor in the selling of most products. In the case of sugar, after exhaustive consideration, the company decided to keep advertising costs to a very low figure. This tends to keep down the ultimate cost to the consumer and conserves the slender margins of all who participate at any stage in the production and distribution of sugar. With such a well-known foodstuff, and with such high existing consumption levels, the utmost possible cheapness

is a better salesman than heavy advertising. Such a policy may not be correct for other goods where circumstances are different—as, for example, the company's own building materials, which are extensively advertised.

Modern trends are towards handling refined sugar in bulk, either liquid or granulated according to the needs of manufacturers. These developments demand specialized delivery vehicles and special installations at the customer's factory as well as at the refinery. Liquid sugar is delivered in road tankers in the Sydney area and will be made available in Melbourne if there is sufficient demand. The demand for bulk granulated is slow to develop in Australia but it, too, will come. The company's Australian refineries are fortunately situated for the exploitation of these modern methods of reducing costs and giving service to customers.



CHAPTER 8

Sugar Refining by C.S.R.

J. VERNON

This chapter describes briefly the physical character and working of the company's refineries, some of the interesting technical aspects of refining, and some of the considerations which govern the economic operation and development of C.S.R. refineries. The transport of raw sugar to the refineries and the marketing of the refined products have already been dealt with.

Dr J. Vernon joined the company to train as a chemist in 1928, obtained his Ph.D. degree at London University, became chief chemist of the company in 1938, and is now one of its two assistant general managers.

December 1955

The name itself suggests the primary function of a refinery—to refine raw sugar into foodstuffs for human consumption. We have seen that raw sugar contains about 98 per cent of sucrose; it is variable in size of grain, in colour and in composition; it is very susceptible to bacterial action and deteriorates rapidly in humid conditions; furthermore it is not handled under the strict conditions of hygiene which are required for a final food product. This raw sugar has to be turned into refined products which will keep indefinitely without deterioration, which are standard in quality and purity, and which are packed and handled in a manner appropriate to a pure food. The main products of a refinery are white refined sugars of various types, soft brown sugars, golden syrup and treacle. Various specialities, such as tablet or loaf sugar and coffee crystals, are produced in small quantities, while liquid refined has been developed fairly recently for bulk distribution to certain large manufacturers. The main product, ordinary crystallized table sugar, is 99.9 per cent pure sucrose, one of the purest of foodstuffs in every respect.

The other main function of a sugar refinery is to hold the stocks of finished products that retail traders and food processors continuously require in modern communities. The refinery at Pyrmont, serving Sydney and the rest of the state of New South Wales, holds stocks at certain seasons of the year of 50,000 tons of raw sugar and 10,000 tons of refined products, representing a total value of about £2,700,000. Even in a smaller refinery these safeguarding stocks are considerable. The total working capital of C.S.R. refineries, mainly represented by stocks of raw and refined sugar and packaging material, fluctuates during the year but the company has to have approximately £10 million available to carry out the refineries' functions as the main commercial or strategic storehouses of sugar products.

The typical raw sugar used in Australian and New Zealand refineries contains 98.4 per cent sucrose and 0.4 per cent water. To get to the standard of 99.9 per cent sucrose would not appear to be very difficult, but we shall see that it is a complex process. This fact, combined with the large quantities involved, calls for big and highly specialized factories.

The Pyrmont refinery's annual capacity of refined sugar products is 200,000 tons, and it is probably the biggest food processing factory in Australia. Refineries are multi-storeyed buildings, which makes it possible to economize in space on expensive city waterfronts, to utilize gravity feed from operation to operation, and to house individual units of plant which in some cases extend vertically through several storeys. While the main operations in a sugar mill can be seen from

one or two vantage points, a refinery is divided into a number of distinct sections, each with its own function, and it is quite difficult in one visit to get even a general understanding of the successive operations. The characteristic noises and smells of a sugar mill are missing; there is, instead, the quiet of the huge stores of bulk and bagged raw sugar, which may occupy as much as three acres of lofty buildings, or of the big sections where syrups are quietly running from filters or circulating in pans and mixing vessels. There is a complex network of pipes conveying syrups from one section to another and circulating them back and forth through various stages of manufacture. A sugar refinery contains most of the unit processes of a chemical engineering textbook—filtration, clarification, gas absorption, precipitation, evaporation, crystallization, surface adsorption, centrifuging, heat exchange and many others. It also involves a wide range of problems in materials handling. Heat and electric power are important items and the boiler and power stations are major installations.

C.S.R. operates six refineries of which five are in Australia, one in each capital city of the mainland, and one is situated at Auckland and supplies the whole needs of New Zealand. Tasmania's requirements are supplied from Sydney and Melbourne. The six refineries have a total capacity in excess of 600,000 tons of refined products per annum, individually producing in proportion to the populations of the areas they serve. In the company's balance sheet they are valued at about £10 million, representing about 30 per cent of the total value of the company's fixed assets and its investments in subsidiary companies. To build new refineries of this capacity would cost over £20 million.

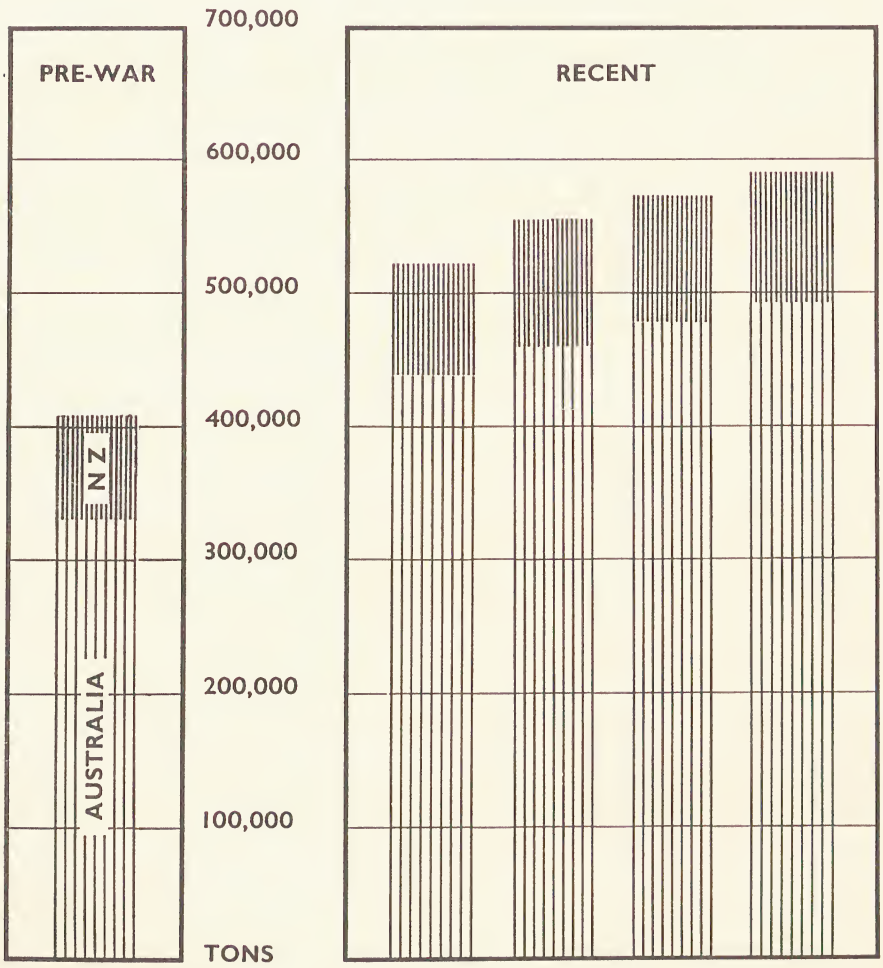
The Principles of Sugar Refining

In order to understand the refining process, it is necessary to examine in more detail the composition of raw sugar. We have seen that it contains about 98 per cent of *sucrose*, which is the chemical name for the pure substance which we ordinarily refer to as "cane sugar". The other constituents of raw sugar are called, in sugar refiners' parlance, the "impurities". Many of them are, in fact, as edible and wholesome as the sucrose itself, but a small number of them are impurities in the sense of contaminants or materials unsuitable for consumption as foodstuffs. The refiner's primary task is to eliminate completely these undesirable contaminants, mostly dirt and bacteria, so that every product of a refinery is of a pure food standard. The next task is to produce a sugar which will keep indefinitely, which is attractive in colour, and which is constant in

purity, taste and all other respects: and this involves removal of all non-sucrose constituents to make a white granulated sugar.

SALES OF REFINED AND OTHER SUGAR PRODUCTS BY C.S.R.

Refined sugar in Australia is manufactured from raw sugar obtained from C.S.R. Company and other mills in Queensland and northern New South Wales. In New Zealand refined sugar is manufactured from raw sugar obtained from Queensland, Fiji and other world sources. *Source: C.S.R. records.*



Pre-War average 1937-38-39		1953	1954	1955	1956
			Years ending 31 March		
78,114	N. Z.	83,624	96,036	95,629	99,000
331,307	Aust.	439,136	460,133	477,845	492,000
409,421	TOTAL	522,760	556,169	573,474	591,000

Chemically there are various types of sugar, the name being given generally to a group of carbohydrates which are sweet and crystalline. One class of "impurities" in raw sugar consists of two chemically different sugars, glucose and fructose, which are described as *reducing sugars*. Glucose, as sold commercially in the form of glucose syrup and best known in confectionery, is usually made from starch. Fructose is not used to any extent as a commercial product. These reducing sugars are present in raw sugar because they are present in the original sugar cane plant and because sucrose is converted into equal parts of glucose and fructose under mildly acid conditions such as may occur at some stages of the milling process or by the action of certain micro-organisms during storage and transport under tropical conditions.

Another group of "impurities" is referred to as *other organic matter*, an omnibus term which covers a large number of substances such as small pieces of fibre carried through the milling process from the original cane, suspended protein material, gums and waxes, poly-saccharides, micro-organisms and their products, and fluff from jute bags. These substances are contaminants, some of which produce turbidity when raw sugar is dissolved in water. Other compounds such as aconitic acid, furfural, amino acids and anthocyanin are included in the organic matter group. There is also the complex substance called caramel, which is formed by the partial decomposition of sugars, particularly at high temperatures, during the milling process. Caramel is mainly responsible for the yellow or light brownish colour of raw sugar which must be removed in making white refined sugar.

Ash (or, as it is sometimes termed, *mineral matter*) is also an omnibus term to include a number of mineral constituents such as the salts of iron, potassium, calcium and magnesium. Some of these come from the original cane juice and from the soil brought into the mill with the cane stalks, while others have been carried over from the purification process at the sugar mills, where lime is added as a partial clarifying agent.

With this introduction, we can now consider the composition of a typical Australian raw sugar such as is handled at one of the C.S.R. refineries. Its analysis would be approximately as follows:

Sucrose	*98.4* per cent
Reducing sugars	*0.5* „ „
Other organic matter	*0.5* „ „
Ash	*0.2* „ „
Water	*0.4* „ „
	100.0 „ „

Although the proportions of the non-sucrose constituents appear small in relation to sucrose, they nevertheless amount to considerable quantities during a year's operations. For instance, in a refinery handling 200,000 tons of a typical raw sugar per annum the above percentages would represent the following tonnages over the year:

Reducing sugars	*1,000 tons*
Other organic matter	*1,000* ,,
Ash	*400* ,,
	2,400 ,,

The non-sucrose constituents can be used to make other products of the refinery. These other refined products, making up about 5 per cent of the refineries' output, are No. 3 brown sugar, golden syrup and treacle. Each of these products requires the presence of selective amounts of the reducing sugars, organic and mineral constituents which have been rigorously excluded from the white refined sugar. The refiner's task also involves, therefore, the separation and selective redistribution of the various non-sucrose constituents into products other than white refined granulated sugar.

This makes clear the answer to a question which is sometimes asked, "Why bother to refine raw sugar at all when it already contains over 98 per cent of sucrose?" The answer is that raw sugar would be quite useless for many food and drink manufacturers, and that the contaminants, although small in volume, have most undesirable characteristics. They impart off-flavours, after-tastes and odours which people find unpleasant. For some foods and many drinks, the brown coloration of raw sugar is unacceptable. The hygroscopic film around the raw sugar crystals is an excellent medium for the growth of bacteria and moulds so that the sugar would not keep in the warehouses, the grocers' shops and the home. The bacterial count is high and precludes the use of raw sugar in a great many bottling and canning processes; and raw sugar slowly deteriorates into a fermenting, sticky mess. Raw sugar is too variable a product to be accepted for use in standardized manufactured foodstuffs. Overriding all considerations is the fact that raw sugar is not a pure food product, prepared, handled and transported under conditions which must be applied to a foodstuff for consumption. These are the basic factors which account for the fact that nowhere in the world do advanced communities eat raw sugar.

The Refining Process

The modern refining process has been developed and improved over a long period of years. The process is a complicated one and in order to give a simple picture it is necessary to eliminate much of the detail, particularly of the way in which syrups of varying concentration and degrees of purity are recirculated through the process. For the purposes of this book, however, we can describe the main features of the successive steps shown on the coloured flow diagram.

Raw sugar, as received from the mills in bulk or in bags, consists of crystals of fairly pure sucrose, surrounded by a film of syrup which contains the greater part of the non-sucrose constituents whose elimination is the prime task of the refiner.

The first refining process is aimed at removing as much as possible of the syrup film from around the sucrose crystals. This is done by "washing" the raws with hot water in high-speed centrifugal machines. To do this the crystals of raw sugar and a hot sugar solution of lower purity and high concentration are mixed into a slurry, in which the film on the crystals is softened and diluted without appreciably dissolving the sucrose crystals themselves. The slurry is fed into centrifugal machines which are, in effect, perforated baskets capable of being revolved at high speed; the syrup is spun off, and the crystals are washed with hot water which carries with it much of the film surrounding the original crystals. This process removes about three-quarters of the non-sucrose constituents originally in the raw sugar and concentrates them in the form of a low-grade solution which can be more efficiently handled in a separate recovery system.

The "washed" sugar, noticeably lighter in colour than the original raw sugar, is next dissolved in hot water to give a concentrated, turbid syrup which is then subjected to the "carbonatation" step of the refining process. This is a method which is not widely used by other cane sugar refiners, except for Tate and Lyle Limited. The latter, in the United Kingdom, and C.S.R., in Australia, have carried out considerable research to develop the method, which consists essentially of the addition of lime to the concentrated sugar solution and the precipitation of this lime by bubbling carbon dioxide through the solution. The carbon dioxide is obtained cheaply by extracting it from the flue gases of the boiler station. During the precipitation and growth of the fine calcium carbonate (chalk) crystals many complex organic impurities are coagulated and trapped, or adsorbed, by the precipitate. The calcium carbonate thus formed becomes the filter medium in the subsequent filtration stage.

After carbonatation is completed the solution is filtered through cotton cloth in pressure filters which remove the precipitate, with the coagulated impurities, bacteria and micro-organisms which it contains, leaving a sparkling, straw-coloured sugar solution known as "raw liquor".

The next purification step eliminates most of the colouring matter and dissolved minerals. The transformation from yellowish raw liquor to colourless, sparkling syrup, known as "fine liquor", is a striking change achieved by the action of bone charcoal, a black granular material made by heating beef bones to a high temperature in closed retorts. Even to the chemists specializing in this work, the actual mechanism by which bone charcoal effects the change is still something of a mystery, although the basis of the mechanism is that the bone charcoal particles consist of a highly porous framework of calcium phosphate completely covered with a thin layer of carbon. Because of its multitude of pores, each small granule of bone charcoal presents a relatively enormous area of the carbon layer and it is generally believed that this carbon is in a sufficiently activated state to adsorb large quantities of colouring matter and mineral matter from any solution.

The raw liquor from the filters is run through large vertical cylindrical tanks filled with bone charcoal, and the fine liquor emerges at the bottom containing only a trace of the original organic and mineral impurities.

At the next stage of the process the sucrose in the liquor gets back to the solid crystalline form. Fine liquor is run into vacuum pans where it is boiled under high vacuum; this allows water to be evaporated off at about 140°F. thus avoiding the use of high temperatures and minimizing the destruction of sucrose and the formation of colouring matter. As evaporation proceeds, a point is reached where the solution becomes supersaturated and, by use of a special technique, a cloud of microscopic crystals is made to form suddenly throughout the solution. The rate of evaporation and the rate of addition of fresh fine liquor are controlled so that the solution is kept just supersaturated and the grains of the original crop of microscopic crystals are made to grow gradually without any new crop forming. At the finish of boiling the vacuum pan is full of a heavy mixture of crystals of the required size plus residual syrup; this mixture is discharged and run into centrifugal machines working on the same principle as those used in the "washing" stage. The residual syrup is spun off through the perforated baskets and the pure crystals are retained. A light spray of water aids the removal of traces of adhering syrup.

The crystallization process does not stop after one boiling. Although

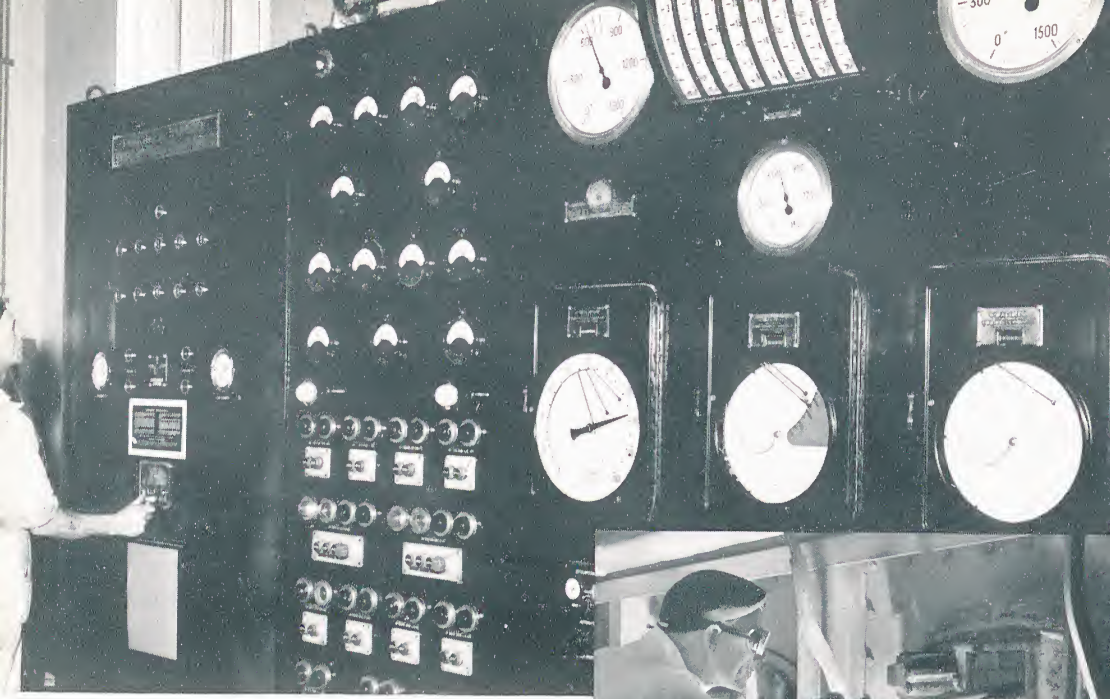
New Farm Refinery, Brisbane.

Entrance to Yarraville Refinery, Melbourne. Employees' amenities block on right.

Inspecting the canteen kitchen at Yarraville Refinery. *At left:* Messrs E. Thatcher, amenities supervisor, and A. G. Stokes, refinery manager.

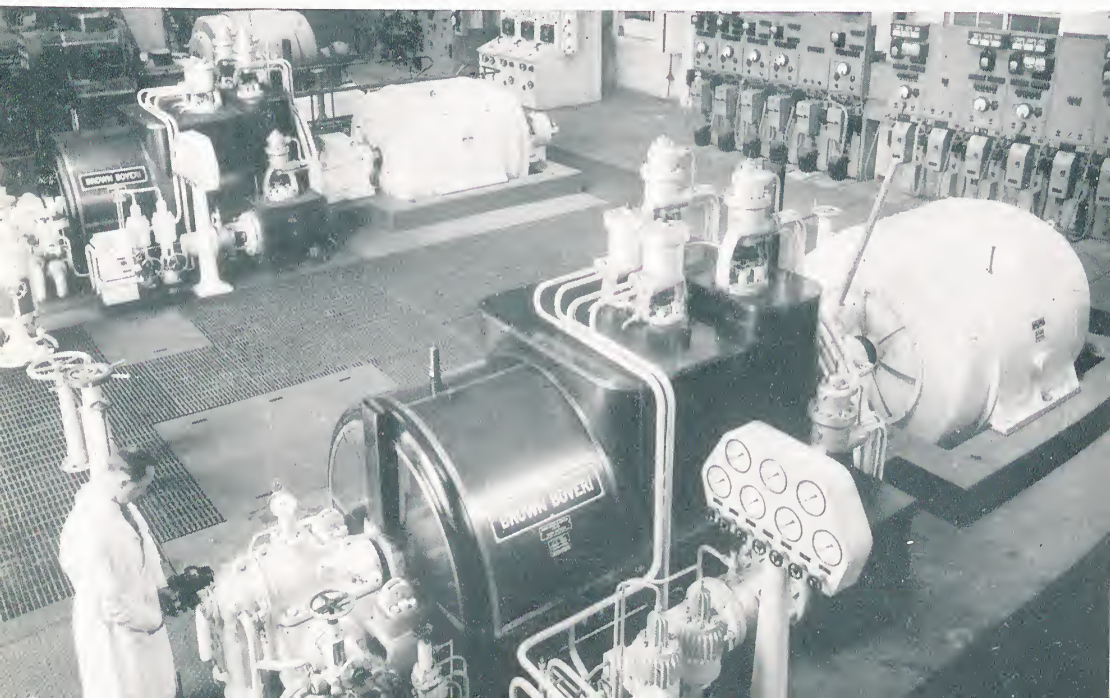
Glanville Refinery, Adelaide.

Cottesloe Refinery, Perth.



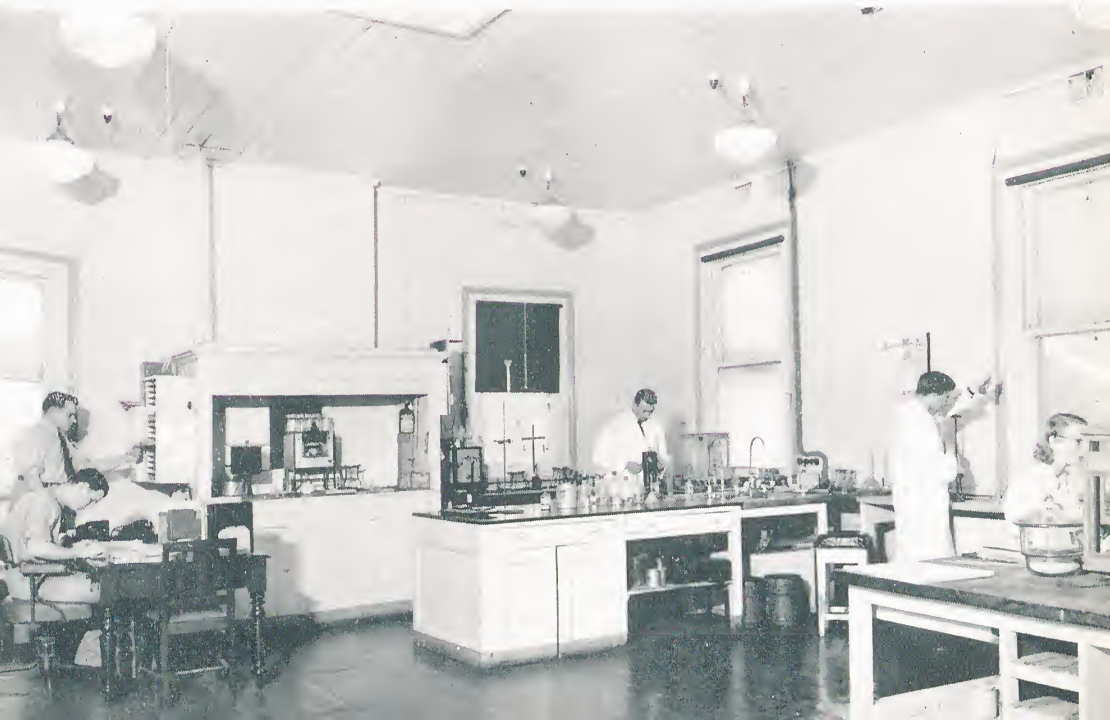
Above, control panel of new high pressure boiler station, Pyrmont Refinery. *Right:* Inspecting furnace.

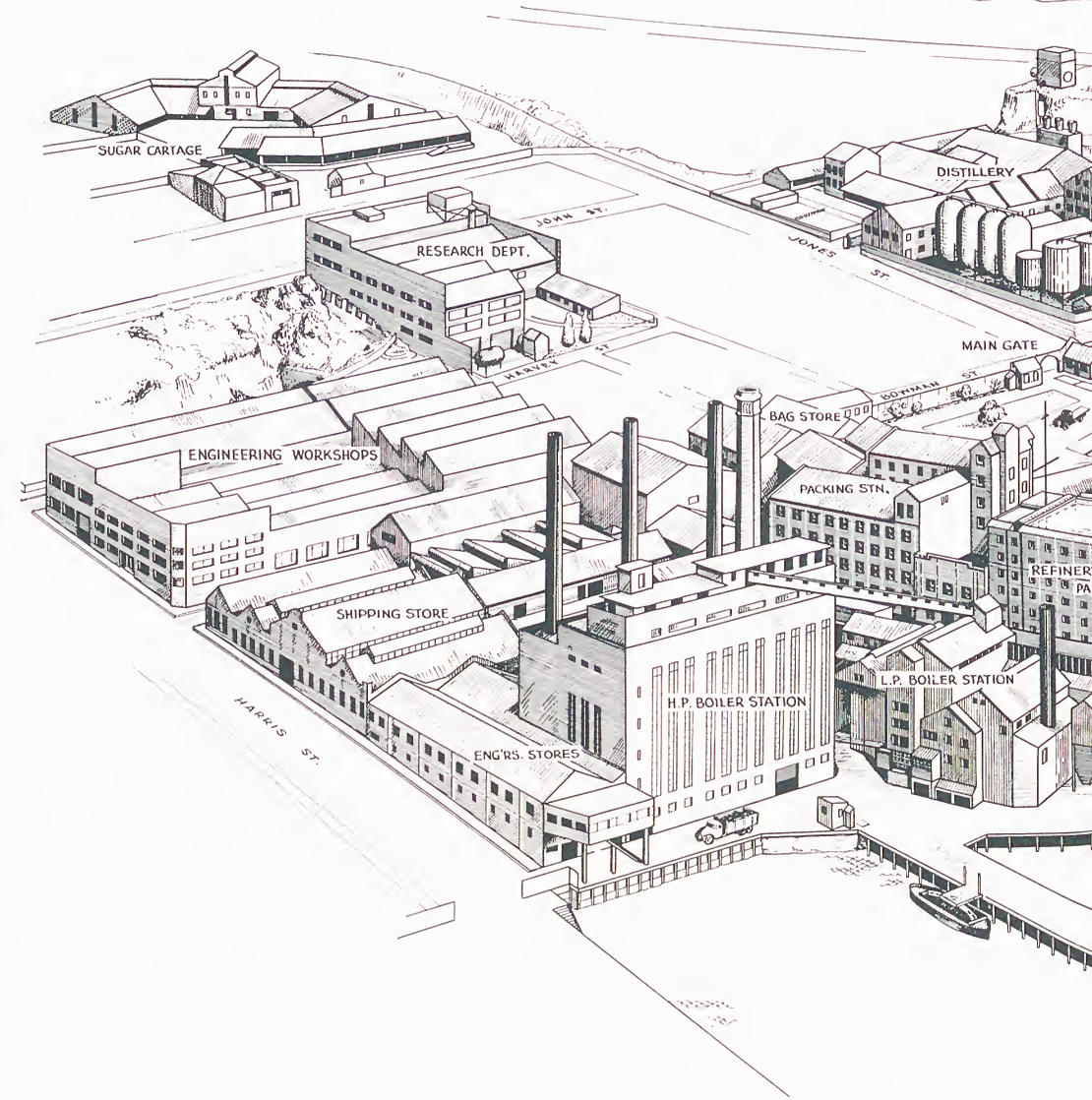
New electric power station, Pyrmont Refinery. The turbines are driven by high pressure steam from the boiler station. Low pressure exhaust steam from the turbines is used in the refinery. *At left*, Mr C. F. Rigby, chief engineer, Pyrmont Refinery.



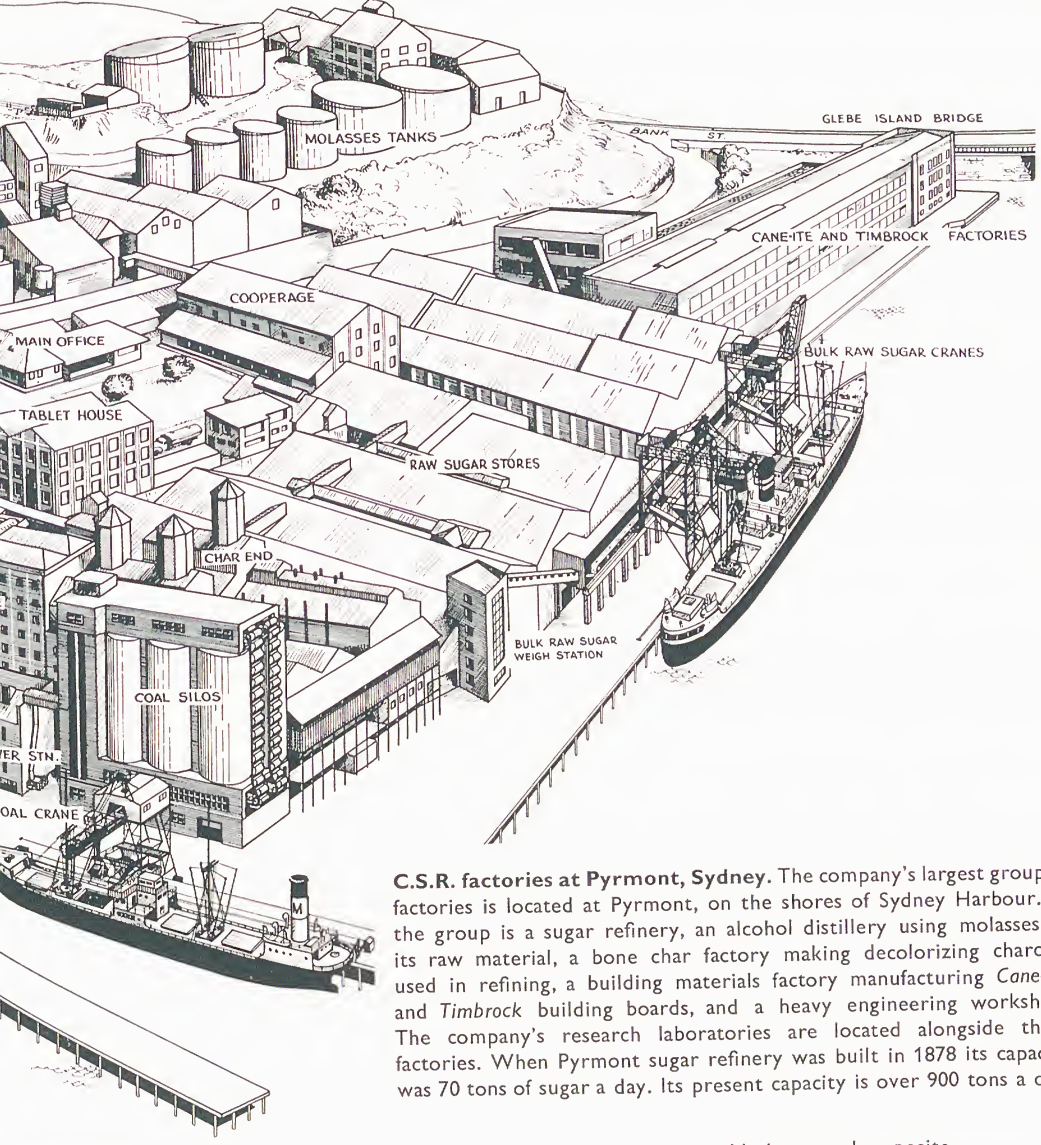
On the pan floor, Yarraville Refinery. Where major technological change does not occur old plant like this, when well maintained, gives efficient results. *At right:* Messrs T. Kennison, process foreman, and G. W. Watson, shift chemist.

Refinery laboratory, Yarraville. *From left:* Messrs W. Opstelten, R. Zindler seated, P. J. Noble, J. P. Moulding and Miss M. Vitolins.





Below: Pyrmont Refinery, 1878, shortly after it commenced operations.



C.S.R. factories at Pyrmont, Sydney. The company's largest group of factories is located at Pyrmont, on the shores of Sydney Harbour. In the group is a sugar refinery, an alcohol distillery using molasses as its raw material, a bone char factory making decolorizing charcoal used in refining, a building materials factory manufacturing *Cane-ite* and *Timbrock* building boards, and a heavy engineering workshop. The company's research laboratories are located alongside these factories. When Pyrmont sugar refinery was built in 1878 its capacity was 70 tons of sugar a day. Its present capacity is over 900 tons a day.

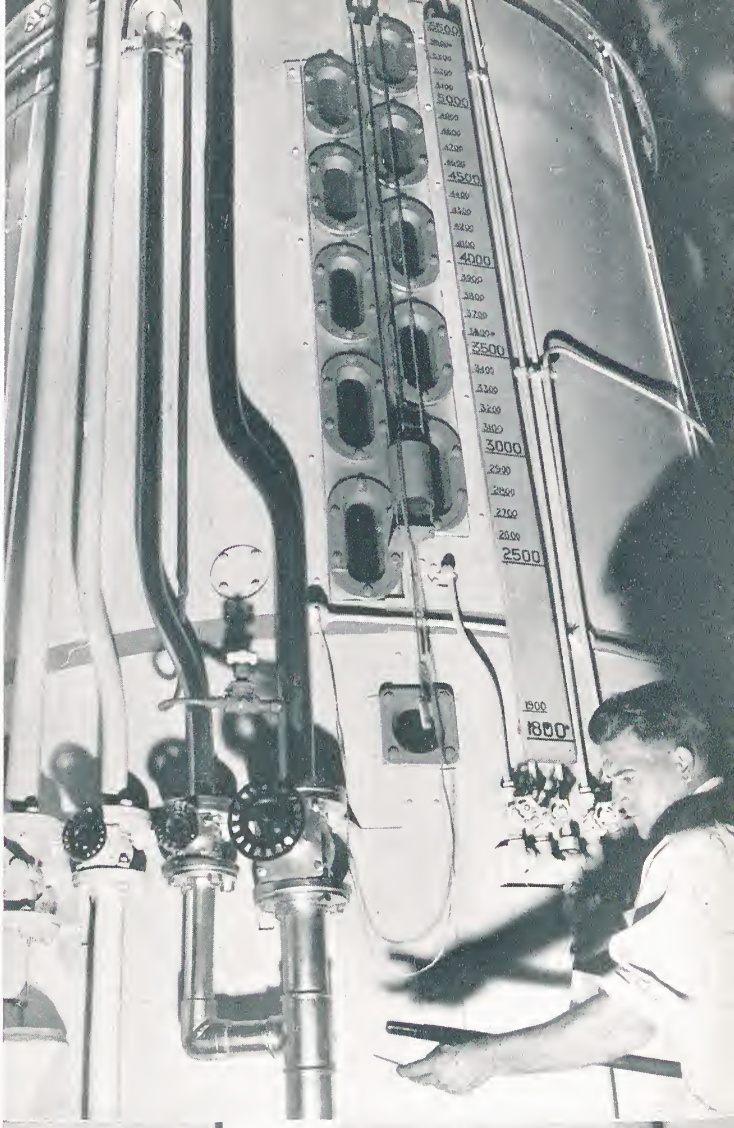
Below: Pyrmont Refinery, 1955, from the same viewpoint as the old photograph opposite.

Carbonatation tanks, Pyrmont Refinery. Milk of lime is added to a solution of "washed" raw sugar in these tanks (see text) and carbon dioxide from waste flue gases bubbled through to precipitate calcium carbonate. The fine calcium carbonate adsorbs a large part of the coagulated impurities and also acts as a filter aid in the subsequent filtrations. The successful operation of the carbonatation process depends on the correct choice of conditions such as temperature, initial alkalinity, final alkalinity, temperature of reaction, and also on the maintenance of such conditions within close limits. The process is automatically controlled by instruments.

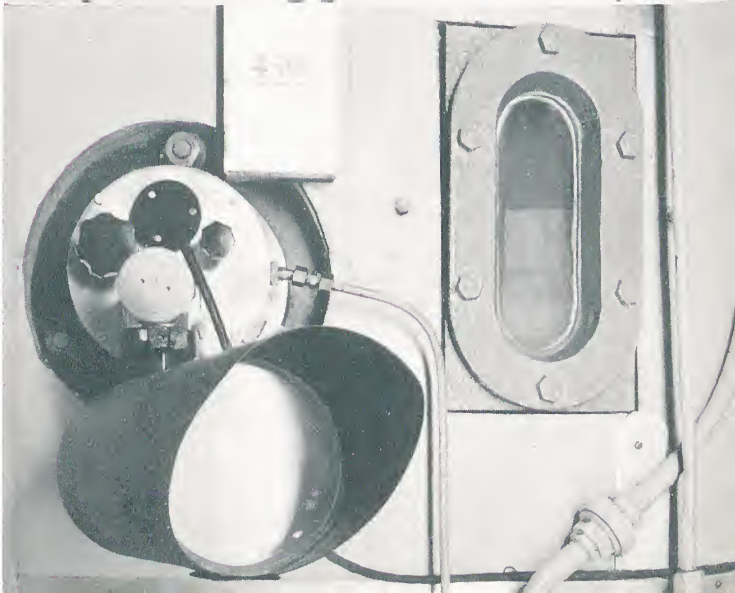
Filter press, New Farm Refinery. *Foreground:* Operator fitting new filter cloth. The solution from the carbonatation process, containing suspended calcium carbonate and coagulated impurities, is forced under pressure through cotton cloths. A clear honey-coloured "raw liquor" emerges from the filter presses.

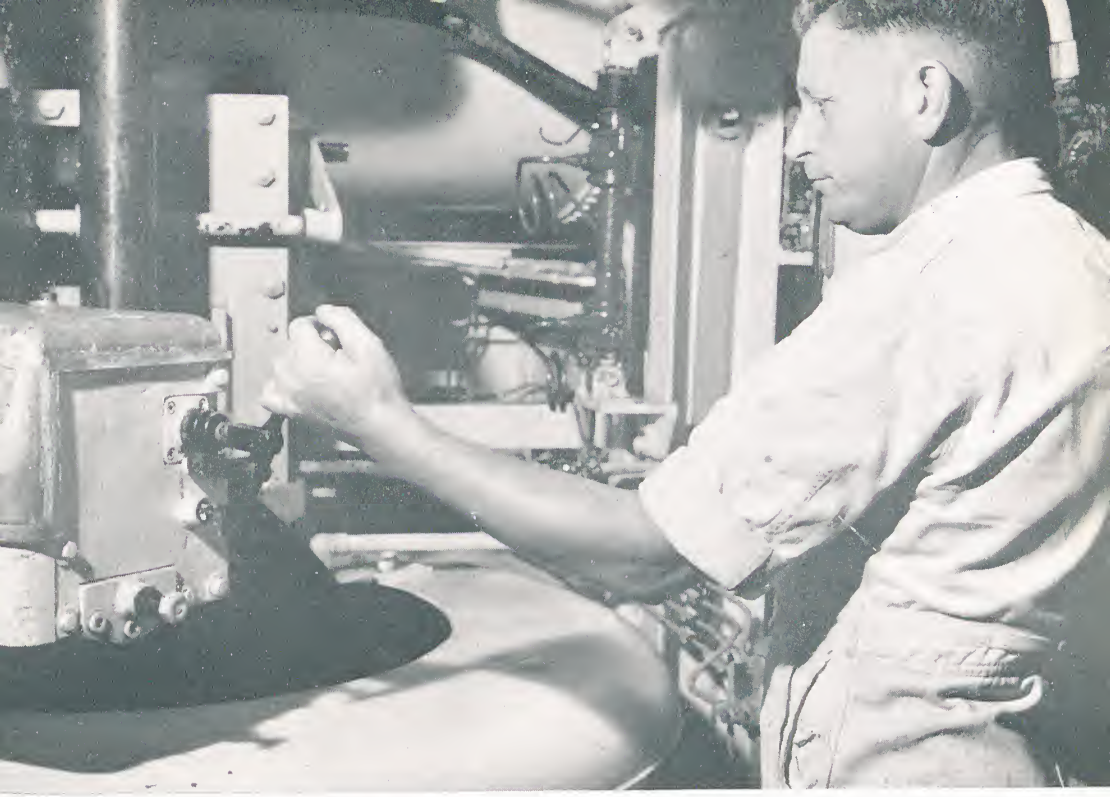
Char cisterns, Cottesloe Refinery (*from a retouched photograph*). Filtered "raw liquor" is run through cisterns containing granular bone char, which removes colouring matter and mineral constituents. The char is made by heating bones in closed retorts at high temperatures. It consists largely of calcium phosphate in the form of a porous "skeleton" coated with active carbon. A large surface area of carbon is thus available to adsorb colouring matter and mineral salts from sugar solutions. After use the char is washed, regenerated by heating—which decomposes adsorbed organic material —and used again.

Sugar boiler drawing a sample from a vacuum pan, New Farm Refinery. Sugar is sensitive to excessive heat, which tends to destroy the sugar itself and to colour it. If sugar solutions were boiled in open pans the temperature would reach 240°F, but similar solutions will boil at 140°F under vacuum with little danger of loss or discoloration by heat. To make crystals of white refined sugar a clear sugar solution of high purity called "fine liquor" is run into a vacuum pan (see text and colour diagrams). The solution is heated and, as it boils, water is evaporated off until it becomes supersaturated. At this stage crystals of sugar form and continue to grow as boiling continues. The crystallization process must be precisely controlled so that the requisite number of microscopic crystals are formed initially, and grow to the required uniform size as quickly as possible. Control instruments help the sugar boiler in his work, but the process still demands skill and experience.



A microscope on a vacuum pan. A magnified image of crystals forming and growing in the pan is projected on a screen.



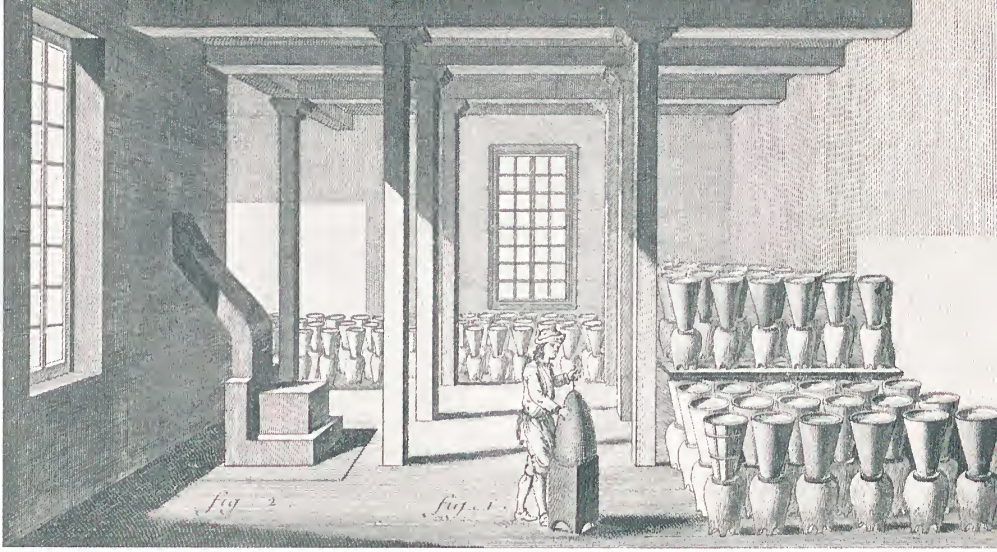


Above: Operator and centrifugal machine, Yarraville Refinery. Centrifugal machines, which separate crystals from syrup, make possible the manufacture of free-flowing granulated sugar. Before the introduction of centrifugal machines, about the middle of last century, sugar in the form of separate small crystals could not be made commercially.

A mixture of syrup and crystals, called *massecuite*, from the vacuum pans is poured into perforated baskets in the centrifugal machines. The baskets are revolved at high speed and the syrup is flung off (see colour diagram). In recently-developed forms of the machine all operations are done automatically.

After discharge from the centrifugals the crystals of refined sugar are dried, graded and packed.

Left: Packing refined sugar in 70 lb. bags, Pyrmont Refinery.



Until the middle of last century, when the development of the centrifugal machine enabled loose, dry crystals to be made, refined sugar was made in conical loaves formed by pouring a mixture of crystals and syrup into moulds. The syrup drained off through a hole in the apex of the mould. The sugar set hard, and had to be broken up with a mallet before using. From *Agriculture et Œconomie Rustique, 1762-1772.*

Left: The old-fashioned sugar loaf, still made in some European refineries for the Asian and African trade. *Right:* The modern descendant of broken-up loaves—rectangular tablets of refined sugar still popularly referred to as "loaf sugar".

a substantial proportion (about 55 per cent) of the sucrose in the fine liquor has been obtained in crystalline form, the residual syrup still remains. This is collected and subjected to a similar boiling process to give a further yield of crystals, and this is repeated a number of times. The effect of all this is to remove and recover the greater part of the sucrose in pure crystalline form, and to concentrate the non-sucrose constituents in the residual syrup which becomes lower and lower in purity. The end is reached when the residual syrup contains such a high ratio of "impurities" to sucrose that the syrup is heavy and viscous and further treatment becomes uneconomical. This last syrup is molasses, into which have been concentrated all the non-sucrose constituents not removed or destroyed earlier in the process.

Damp refined sugar from the centrifugal machines (the "fugal station") is passed through revolving drum driers where moisture is reduced to less than 0.1 per cent by warm air. It is then sieved to give grades of uniform crystal size, passed to the storage bins, and thence is packed in bags for delivery to consumers.

This account of the refinery process has necessarily been greatly simplified. Some syrups, for instance, are run through the char cisterns a second time to raise purity and improve colour before proceeding further. Again, at a certain stage in the crystallization sequence the syrup becomes too high in non-sucrose constituents to produce crystals of the required purity. Some of this syrup is used for making special products such as golden syrup, treacle, and soft brown sugar, while the remainder goes to the "recovery" or "boil-out" house. Here it is mixed with the syrup made from the original washing of the raw sugar and is crystallized in vacuum pans in three controlled stages to yield crystals whose purity is equivalent only to that of a low-grade raw sugar. These crops of crystals are returned to the beginning of the whole refining process, and again pass through carbonatation, filtration and all subsequent steps.

All the unwanted impurities gradually accumulate in the syrups of the "boil-out" section. The rate of crystallization in these syrups is very low and a point is reached where the rate is retarded so much by the impurities present that further attempts to extract the remaining sucrose are not worth while. This point must be decided by a carefully balanced determination. The resultant black viscous syrup, molasses, is the residual product of the refinery.

It is difficult to convey an impression of the complexity associated with the large number of syrups of different purities circulating in the various sections of the refinery. At Pyrmont refinery, for example, there are, at any instant, about 1,000 tons of materials, made up of some

fifty different grades and types, circulating throughout the plant, each strictly directed along its own particular course of pipelines and tanks. There are also over 1,000 tons of decolorizing charcoal slowly moving through a continuous cycle in the decolorizing and regenerating plants.

Check and Counter-Check

Throughout the day and night sampling and analysis go on continuously in order to keep each section of the process under close control. Continuous sampling devices collect samples of all the different grades of liquors and syrups. Every second or third bag of the raw sugar entering the refinery is sampled by means of a steel prong which is poked into the bag to extract about a dessertspoonful of sugar. Syrups, refined sugar, bone charcoal, filter mud, coal, coke, and lime are all sampled at a planned frequency. The water circulating in process is also sampled continuously at various check points. This includes water from the condensers, heat exchangers and vacuum pans, washing water from char cisterns and filters, water from sugar dust scrubbers, boiler feed water, and all water leaving the refinery via refinery drains.

The laboratory staff analyses this constant flow of samples, and supplies a running bulletin of temperatures, densities, colours, ash, reducing sugar, and sucrose contents. The supervisory staff can thus detect and quickly correct any trend away from standard at any point in the process.

One of the most important controls is the *pH* figure which is a measure of acidity. In acid solution cane sugar is converted into reducing sugars, the reaction being more rapid the more acid the solution. Care must be taken not to allow any of the solutions circulating in the process to become even slightly acid, otherwise some sucrose will be destroyed. In critical sections of the process, recording instruments are used to give an automatic and continuous record of *pH* values.

The ash content and reducing sugars content of the various liquors and syrups are determined every eight or twenty-four hours so that the chemist in charge of the shift can ensure that the required degree of purity is being reached in each operation. For instance, by the time the sugar solution has been carbonatated, filtered, passed through the decolorizing stage and made ready for crystallizing in the vacuum pans, about 90 per cent of all the impurities and colouring matter should have been removed. Once having diverted these impurities into lower-grade syrups care must be taken to see that they do not contaminate the

higher-purity syrups again, otherwise some of the work already performed would be undone. The reducing sugar content of each material also indicates to the shift chemist whether destruction of sucrose is occurring. This may be the result of bacterial action or of an increase in acidity.

Since all water added in the refinery process must eventually be evaporated, the aim is to use as little water as possible. Densities, or specific gravities, of solutions provide an index of the proportion of dissolved solids to water, and therefore serve as important control figures. A small percentage reduction in density of any of the materials in process can produce a noticeable increase in the weekly coal bill.

The decolorizing section of the refinery is virtually a chemical plant complete in itself and requiring specialized control. Bone charcoal is an expensive material and must be handled carefully, firstly to prevent loss by abrasion into useless dust and secondly to prevent oxidation and other changes in its chemical composition during regenerations at high temperatures in the kilns. Its decolorization and ash adsorption properties are very sensitive to the time and temperature of revivification. It can also be a great harbourer of micro-organisms which destroy cane sugar, and in this respect needs close supervision. The bone charcoal must therefore be analysed frequently for carbon content, decolorizing power, *pH* and volatile organic matter. A full chemical analysis is carried out at regular intervals to see that no slow change in chemical composition is taking place and a sieve analysis is done at the same time to see whether the particles are suffering physical breakdown.

In addition to supplying the supervisory staff with the hour-to-hour information necessary for the efficient running of each section of the process, the laboratory also carries out at regular intervals a complete chemical balance of each and all of the constituents of the sugar products going into and out of the refinery.

For the main constituent, sucrose, a typical sucrose balance would be:

Sucrose introduced	*100.0 per cent*
Sucrose in refined products	*98.4* „ „
Sucrose in molasses plus Sucrose lost in process	*1.6* „ „
	100.0 „ „

The figure of 1.6 per cent is divided approximately equally between molasses and process loss. This proportion and the total figure itself,

in a book of this nature. As with most industrial research, there are two main types of investigation: first, the improvement of existing processes in order to lower costs and, secondly, the search for new processes which give economically better performance than those now in use. Much of the work of both types starts on the laboratory bench but, if promising, may be fairly quickly translated to the pilot plant stage where operating characteristics can be determined under conditions more closely approaching the factory scale.

Other Refined Products

There are three well-known refined sugar products in addition to white sugar; these are brown (or No. 3) sugar, golden syrup and treacle.

Brown sugar, especially beloved by children for their breakfast cereals, is a small-grained, rather moist sugar with a characteristic flavour. It is made to the following standard composition:

Sucrose	91.5	*per cent*
Reducing sugars	2.5	„ „
Other organic matter	1.9	„ „
Ash	1.4	„ „
Water	2.7	„ „
	100.0	„ „

It is manufactured by utilizing the fact that as successive boilings are carried out in the crystallization process the residual syrup has a higher and higher content of non-sucrose constituents. When the appropriate composition has been reached, the syrup is boiled and crystallization is specially controlled to give "brown sugar". The crystals are handled through the centrifuges in a special way and are not sprayed with water, as is done with white sugar, so that the adhering film of the residual syrup is left on the crystals to impart the golden-yellow colour and the characteristic flavour.

Golden syrup is a standardized refined product containing a high proportion of the reducing sugars, glucose and fructose. Its composition is approximately as follows:

Sucrose	27.0	*per cent*
Reducing sugars	47.4	„ „
Other organic matter	4.4	„ „
Ash	3.2	„ „
Water	18.0	„ „
	100.0	„ „

It will be noted that sucrose and reducing sugars together amount to 74.4 per cent of the weight of golden syrup. If attempts were made to prepare a syrup containing this percentage of sucrose alone, the syrup would be supersaturated and sucrose would crystallize out. Similarly, if all the sugar content was in the form of reducing sugars glucose would crystallize and give a product similar in appearance to "candied" honey. The proportion of sucrose and reducing sugars in golden syrup (approximately $1\frac{3}{4}$ parts reducing sugars to 1 part of sucrose) are precisely controlled so that the syrup is stable. At these proportions, neither sucrose nor glucose will crystallize from solution.

In the refinery process none of the syrups in process has the high reducing sugar content required for golden syrup and it is necessary to prepare special batches of "invert syrup", using the fact that if a sucrose solution is heated under acid conditions it is converted completely into equal parts of glucose and fructose. The invert syrup is neutralized and filtered, and then added to other syrup of known composition, to give a mixture of the analysis shown above.

Treacle is a similar product of darker colour and stronger flavour.

Steam and Electricity

Every process in refining is carried out with heated sugar solutions and the heat is supplied by steam. The biggest single use of steam is in the eventual evaporation of water from these solutions. It will be remembered that at an early stage in the refinery the incoming sugar is dissolved in water while the end products are largely dry crystalline sugar, so that virtually all water added initially or throughout the process must be evaporated off. The whole process is therefore a large steam user. Temperatures are never very high, since destruction of sucrose must be avoided, so that steam pressures from 10 lbs. to 30 lbs. per square inch are mainly required.

There is also a substantial demand for mechanical power to drive the pumps, belt conveyors, centrifugal machines, driers, graders and many other machines. This demand for power, coupled with a heavy usage of relatively low-pressure steam, has enabled the development of a convenient and efficient steam-power balance. Whereas a railway engine exhausts its steam to the atmosphere after using it for generation of mechanical power, in a refinery the exhaust steam, remaining after passing through turbines or steam engines to generate power, can still be used for the entire heating requirements of the process.

The most recent steam and power installations at Pyrmont, Sydney, are illustrated in photographs and diagrams. Steam is produced at 650

lbs. per square inch, and power is produced from electric alternators driven by high-speed turbines. The entire boiler and power station equipment when finally completed will have cost about £2¼ million and serves not only the refinery but also the distillery and the "Caneite" and "Timbrock" factories. It burns about 2,000 tons of coal per week. There is enough electric generating capacity to supply the electricity requirements of a city of 30,000 people, such as, say, Bendigo or Broken Hill, and if all the steam produced were used to drive electric generators it would be enough to supply a city of 100,000 people, such as Hobart.

The economy inherent in the steam-power balance of a refinery can only be achieved by continuous and painstaking attention to every detail of steam and power usage. Coal, because of its greatly increased price, has become a major item in the cost of refining and much technical effort has been devoted to ways and means of decreasing the steam usage of the process. Success in this direction gives rise to power problems, for reduction in the quantity of steam required for evaporation of syrups must be followed by a corresponding reduction in the quantity of steam passing through all engines unless steam is to be blown to waste. There is, therefore, a constant demand for increased efficiency in both production and usage of power.

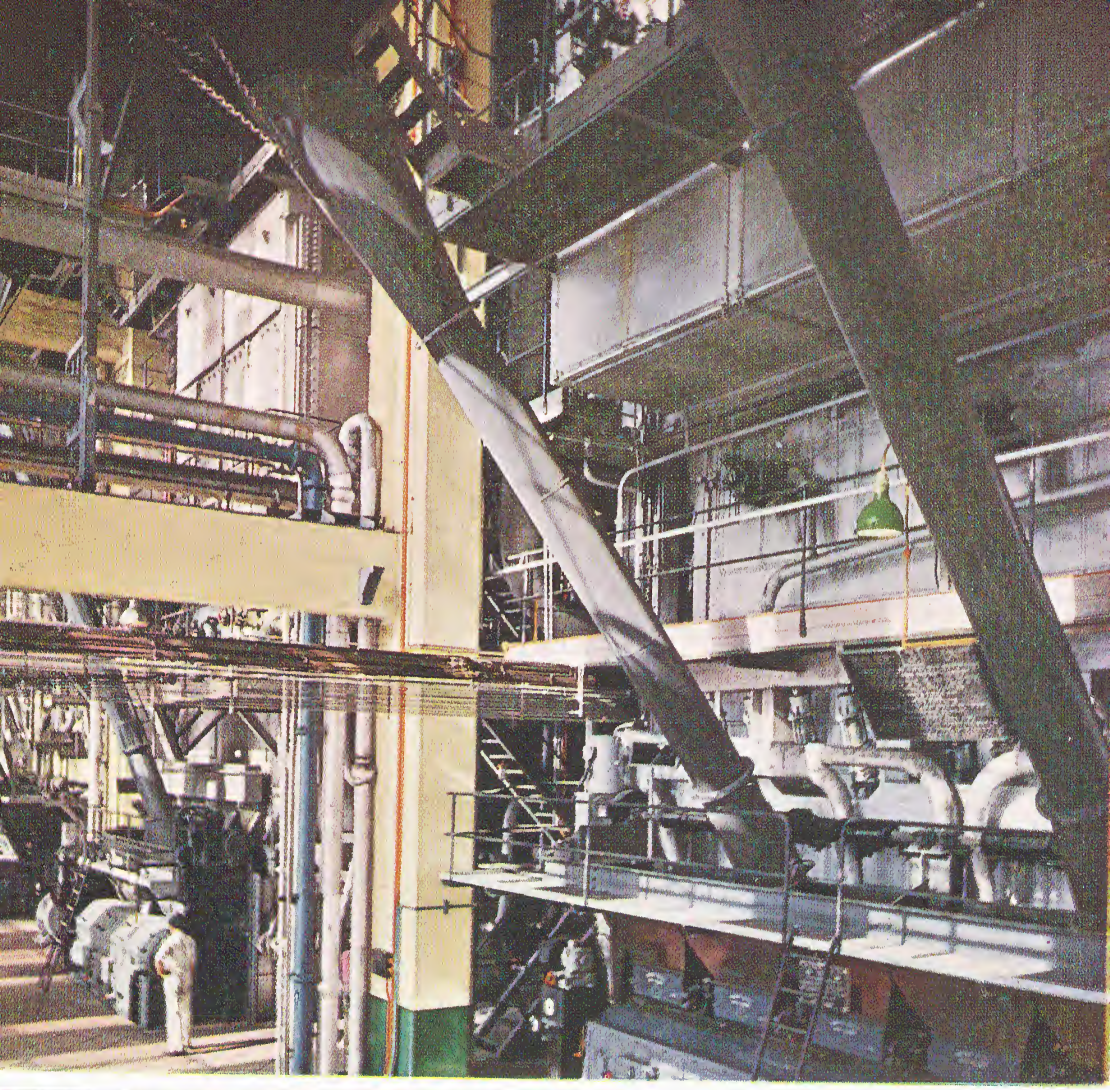
This continuous struggle that has been proceeding in the refinery process has been made more difficult by the fact that refineries, in common with most factories today, are steadily increasing their power demands as automatic, labour-saving equipment is installed. For these reasons a "steam account", akin to the "sucrose balance", is kept and watched.

Seasonal Variations in Demand

The demand for refined sugar varies throughout the year, showing a pronounced seasonal pattern with higher deliveries in the summer months, when consumption of beer and cordials is high and jam making and other preserving take place. The intensity of the seasonal fluctuation varies, due to such things as changes in the fruit crop for canning. The accompanying graph shows the delivery curve of one refinery throughout a full yearly period.

The refiner who has to meet these varying seasonal demands can either install sufficient plant capacity to meet the peaks and so be able to increase his production as needed or can have capacity equal to the average demand and use storage to cope with the variations. Under the latter arrangement, the refiner would accumulate stocks of refined

Chelsea Refinery, Auckland, New Zealand. Refineries are large-scale industrial establishments, situated close to the market they supply. They generally have a deepwater berth alongside to unload cargoes of raw sugar and coal. They also require large quantities of fresh water.

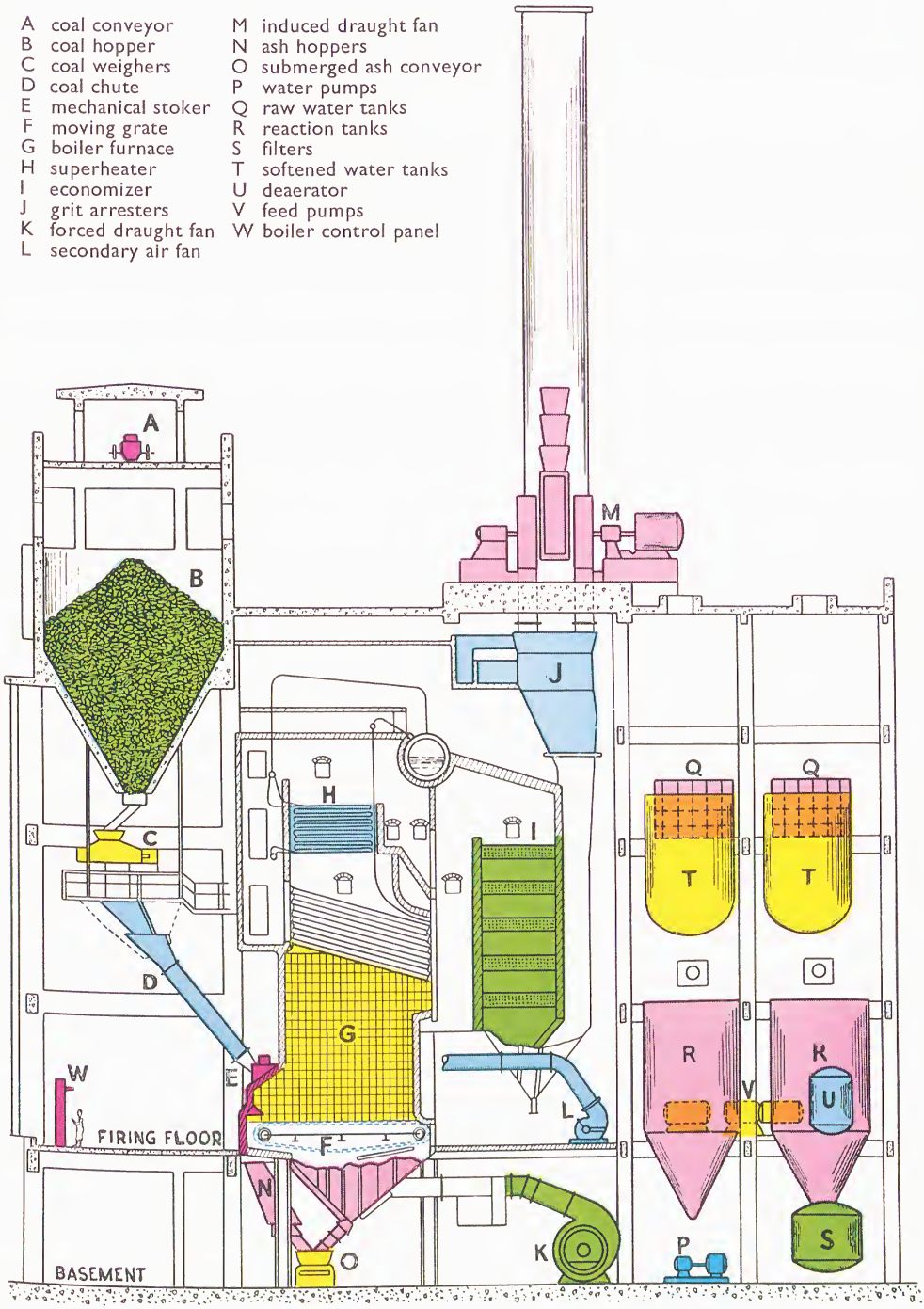


Interior of boiler house, Pyrmont Refinery, Sydney. The boilers provide high pressure steam for electric power generation and for operating machinery. The low pressure exhaust steam from the power station is used for heating. The boiler furnaces are mechanically fed with coal, and the whole station is automatically controlled and operated.

Above: Firing floor, with coal chutes feeding to mechanical stokers. See D and E on diagram opposite. Note comparative size of man.
Left: Boiler control panel. See W on diagram opposite.

SECTION THROUGH ONE OF THREE STEAM GENERATING PLANTS AT C.S.R.'s PYRMONT REFINERY

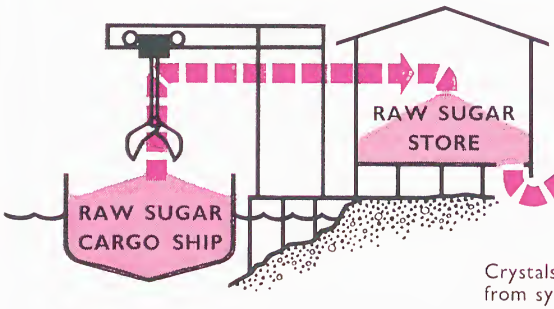
A coal conveyor
B coal hopper
C coal weighers
D coal chute
E mechanical stoker
F moving grate
G boiler furnace
H superheater
I economizer
J grit arresters
K forced draught fan
L secondary air fan
M induced draught fan
N ash hoppers
O submerged ash conveyor
P water pumps
Q raw water tanks
R reaction tanks
S filters
T softened water tanks
U deaerator
V feed pumps
W boiler control panel



REFINING OF RAW CANE SUGAR

This diagram is not to scale and gives only a general indication of the main processes and items of plant. Portion of the process is shown in more detail on the opposite page.

1 Raw sugar made at mills in the cane-growing areas is received in bulk or in bags at refineries in the population centres.



2 Raw sugar is fed into the first stage of the refining process, and mixed with a concentrated sugar solution which helps to remove impurities on the outside of the crystals.

SYRUP

MIXER

WASH WATER

3 Crystals are separated from syrup by spinning in centrifugal machines and are then washed with hot water.

'FUGAL

DISSOLVER

4 The washed raw sugar is dissolved in hot water and the liquor strained.

SCREEN

MILK OF LIME

5 Milk of lime is added to raw sugar liquor and carbon dioxide gas bubbled through.

CARBONATATION TANK

CO_2

6 The liquor is heated and cloth filters remove impurities precipitated by carbonatation process.

FILTER

7 Clear filtered liquor is passed over bone char which removes colour impurities.

BONE CHAR

VACUUM BOILING PAN

CRYSTALLIZATION PROCESS
Illustrated in more detail on opposite page.

8 Clear purified liquor is boiled under vacuum until crystals of pure refined sugar form.

9 Crystals of refined sugar are separated from syrup by spinning in centrifugal machines.

'FUGAL

DRIER

10 Refined sugar crystals are dried, graded, bagged and delivered to consumers.

GRADER

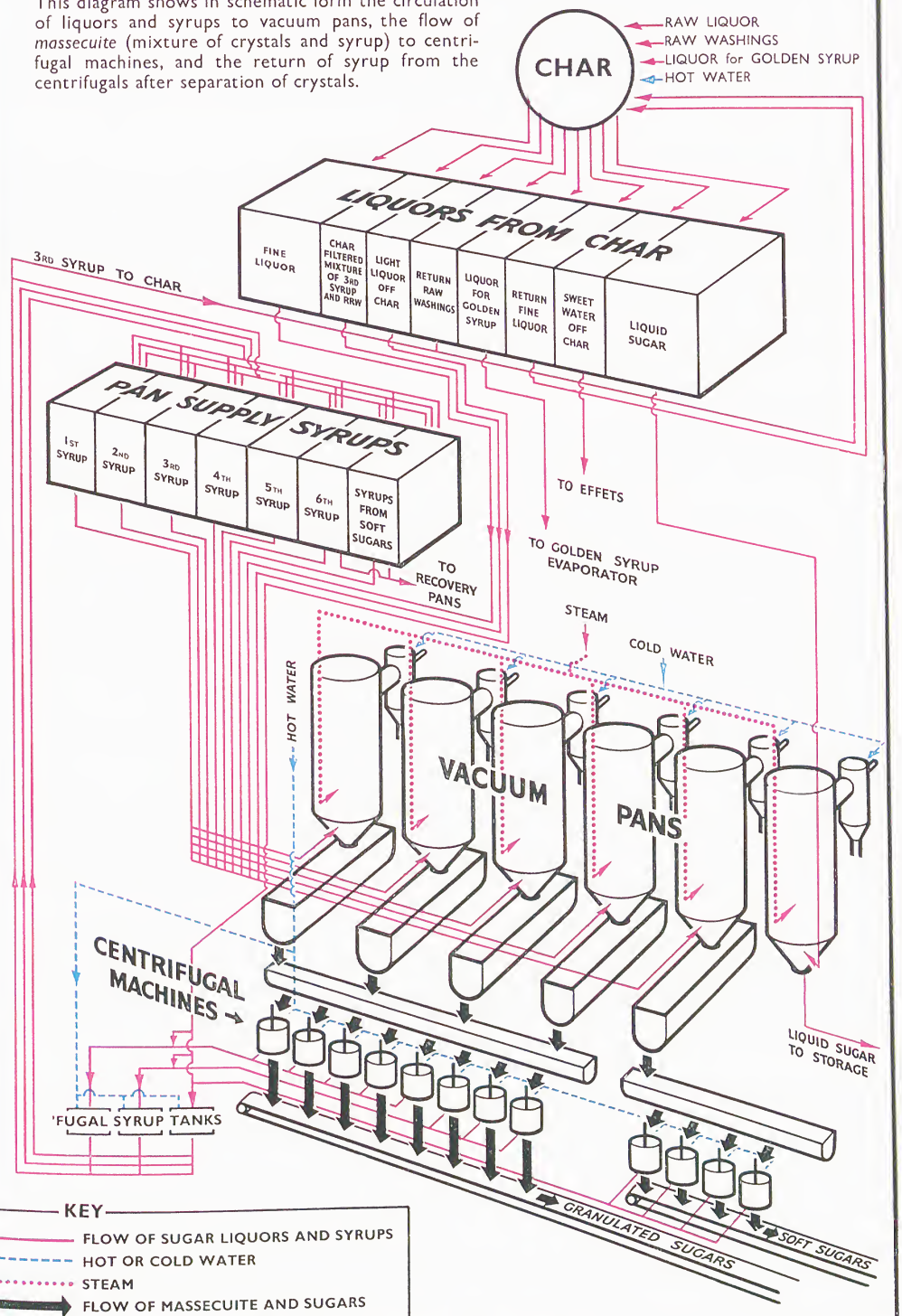
REFINED SUGAR BINS

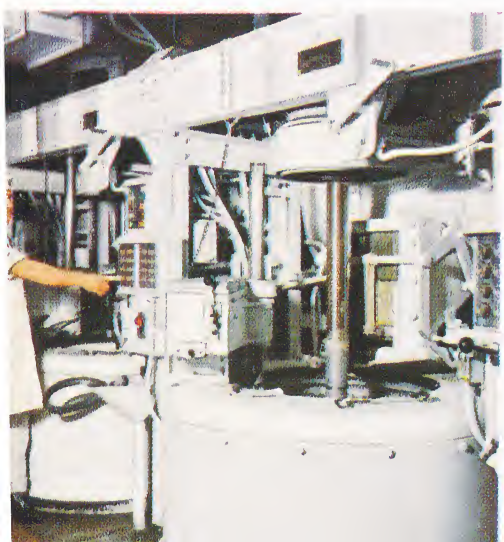
PACKING

TO CONSUMERS

CRYSTALLIZATION OF REFINED SUGAR

This diagram shows in schematic form the circulation of liquors and syrups to vacuum pans, the flow of *massecuite* (mixture of crystals and syrup) to centrifugal machines, and the return of syrup from the centrifugals after separation of crystals.

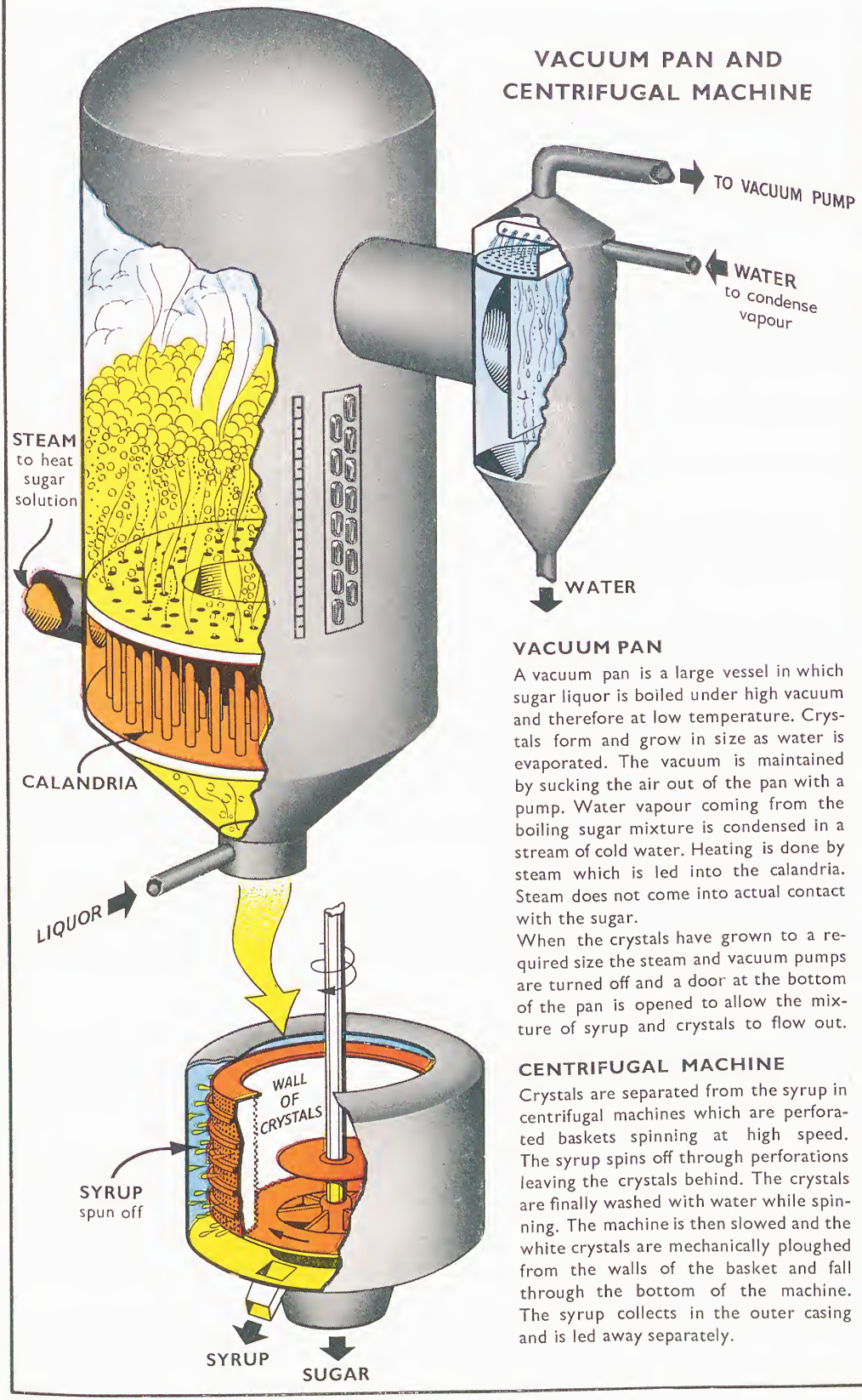




Above: A 14,000 gallon vacuum pan at Pyrmont Refinery. Instruments assist in the control of the process of concentration, formation and growth of crystals, but the art and knowledge of skilled sugar boilers are necessary to make crystals of the right size and uniformity. The sugar boiler above has removed a sample from the pan and is inspecting the crystals on a small plate of glass.

Left: Semi-automatic centrifugal machines at Pyrmont Refinery. A mixture of crystals and syrup, called *massecuite*, is fed from the vacuum pans to the centrifugal machines which spin off the syrup and leave damp-dry crystals.

VACUUM PAN AND CENTRIFUGAL MACHINE



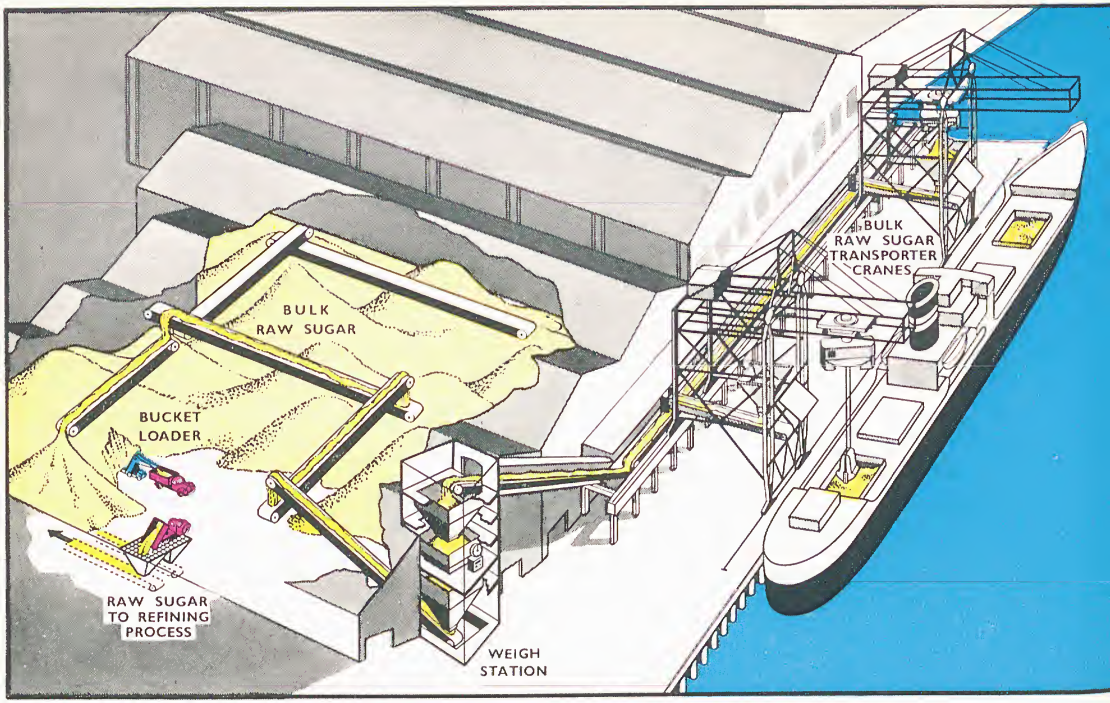
VACUUM PAN

A vacuum pan is a large vessel in which sugar liquor is boiled under high vacuum and therefore at low temperature. Crystals form and grow in size as water is evaporated. The vacuum is maintained by sucking the air out of the pan with a pump. Water vapour coming from the boiling sugar mixture is condensed in a stream of cold water. Heating is done by steam which is led into the calandria. Steam does not come into actual contact with the sugar.

When the crystals have grown to a required size the steam and vacuum pumps are turned off and a door at the bottom of the pan is opened to allow the mixture of syrup and crystals to flow out.

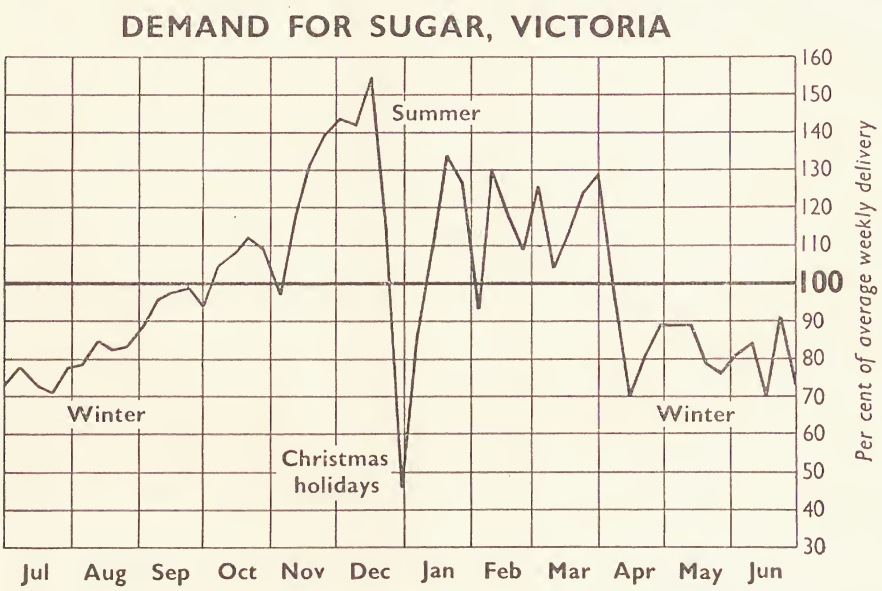
CENTRIFUGAL MACHINE

Crystals are separated from the syrup in centrifugal machines which are perforated baskets spinning at high speed. The syrup spins off through perforations leaving the crystals behind. The crystals are finally washed with water while spinning. The machine is then slowed and the white crystals are mechanically ploughed from the walls of the basket and fall through the bottom of the machine. The syrup collects in the outer casing and is led away separately.



Installations for unloading raw sugar in bulk at Pyrmont Refinery. The diagram shows how belt conveyors carry unloaded raw sugar from the cranes on the wharf and after weighing distribute it in the bulk stores.

Unloading installations are designed to get raw sugar out of the ship and into store rapidly. Raw sugar is fed to the refining process at a slower rate, using six-ton trucks which are filled by a mobile bucket loader and discharge their loads through a grille to an under-floor conveyor system.



Demand for sugar fluctuates over the year. It is lowest in winter and highest in summer, when manufacturers require larger quantities for fruit processing and beverages. Deliveries from Yarraville Refinery, Melbourne, averaged for the corresponding weeks of the years ending 30th June 1954 and 1955, have been expressed as a percentage of the average weekly deliveries for the two years and plotted on the graph above for 52 weeks.

sugar during the slack winter months and would deliver these during the peak summer ones. In actual practice the company's refineries aim at a compromise: production is increased during the peak months, but only to a relatively small extent, and substantial use is made of refined sugar drawn from reserve storage.

A number of considerations govern the relation of storage capacity and refining capacity. The economic balance between the two can be calculated and is given due weight, but an important consideration is that it is difficult and undesirable for a refinery or any other plant to vary its output by substantial amounts over a period of a year. To do so would involve increasing and decreasing employment which would have an unsettling effect on the very important human side of operations. Stability of employment and the benefits which flow from it are powerful arguments in favour of using storage to even out fluctuations in demand.

Refinery Expansion and Modernization

The company is at present engaged in a major programme of refinery development. Working conditions and employees' amenities are being improved. New plant is being installed and new processes introduced to increase technical efficiency and reduce cost of manufacture. Capacities of refineries are being expanded to keep ahead of demand for sugar from increasing populations. For the last five years expenditure on fixed assets has averaged about £500,000 annually, and is currently at the rate of about £1 million per annum.

Many problems have been and are still being encountered. Perhaps the greatest single problem has sprung from the fact that most of the company's refineries were built many years ago. Buildings and plant were provided on quite a handsome scale and stood the company in good stead in the ensuing years. Between the two world wars, the company made good use of its chemical control skills, and major technical advances were achieved in the refinery process and its control which increased effective capacities far beyond the limits thought possible in earlier years. Additional production was obtained with relatively modest capital expenditure, and costs for processing and for maintenance and depreciation were kept down. Under the pricing system in operation in the Australian sugar industry all the savings were passed on to the raw sugar industry.

The limit was reached during World War II and some ten years ago the first steps were taken in the major expansion programme that is still in progress. In these old factories on congested sites, the task has proved difficult and has taxed the ingenuity of the development and design staff to the utmost, while engineers have had to face the task of constructing buildings and installing new machinery in the middle of other plant operating under full production schedules.

The Employees

Although advances have been made technologically and large sums of money have been spent on improving equipment, the success of sugar refining still depends to a great degree on the people, from the manager down, who operate the refining plant.

The six refineries in Australia and New Zealand employ about 2,500 men and women. Two-thirds of them are employed on day-time duties in maintenance, packing, stacking, clerical, chemical, engineering and administrative tasks. These include a wide range of trades and skills—fitters, turners, boilermakers, draughtsmen, carpenters, riggers, packers, bagmakers, cleaners, electricians, storemen,

clerks, typists, chemists and engineers. The other third comprises the operating personnel who work on shift and operate the plant and process throughout the day and night. These are the fugalmen, firemen, filter hands, sugar boilers, engine drivers, liquor runners, supervising chemists and engineers.

In the years following World War II there has been an influx of migrants, many of whom have been initially unable to speak English. The proportion of these New Australians in some sections of the refineries has been high and the language difficulty has added to the burden of the supervisory staff, the leading hands, foremen, supervising chemists, engineers and managers. Despite these difficulties the absorption of New Australians has proceeded satisfactorily and already a number have been appointed leading hands.

Individual sense of responsibility, skill and reliability of our employees is of high importance in the efficient working of our factories. To gain the best contribution of individuals in these respects is the age-old problem of management and leadership. "Technical know-how" is of little value unless it can be applied to the hour-to-hour running of machines and the handling of materials by men on the job. Efficient production has several components: active management, the provision of proper plant and equipment and the existence of a solid core of reliable men to work the factory—men who know their work, understand the jargon of the plant and who really care whether their own work is good or bad. The social relationship and the economic climate are always changing, but we hope that the good relations established over 100 years between C.S.R. employees and management will continue.

CHAPTER 9

C.S.R.'s Unusual Functions in the Australian Sugar Industry

J. M. DIXON

Most of us, naturally enough, understand best the things with which we are personally familiar and we tend to interpret remote things through some aspect which has tangible significance for us from our own experience. Thus most of us know of the sugar industry and think of C.S.R. mainly through the refined sugar that is on our tables every day. Many are not aware of what lies behind the refining operations and find it difficult to appreciate, in correct perspective, the other functions of the company and its position in the industry as a whole, especially as some of these are beyond the normal responsibilities of industry and commerce.

This chapter has therefore been written to give the more interested inquirer an account of the origins and nature of the Colonial Sugar Refining Company's present complex marketing and refining functions. It also refers to the various organizations which operate in the Australian sugar industry and examines the situation in respect of monopoly in the industry.

Although the situation described here is a complicated one, many people know of some part of it and practically all Australians know of the company. Therefore it is interesting to find what opinion of C.S.R. is held by the public; some results of public opinion polls taken since 1942 are given in the concluding part of the chapter.

September 1955

THE factual position in regard to the extent of C.S.R. operations in the Australian sugar industry, stated in summary, is that the company now grows no cane for commercial profit, but helps the farmers with advisory services, agricultural research and cane breeding; it has a large general technical research department working on mill and refinery production problems; it holds a high position in the field of sugar technology; it owns seven of the thirty-four Australian mills and makes about one-fifth of the raw sugar; it refines most of the sugar Australians consume, owning five out of the six Australian sugar refineries; and it administers, operates and finances the marketing pool for Australian raw sugar, under contract to the Queensland Government. These functions are clear-cut except for refining, marketing and financing, and it is to the latter, as they bear upon the company's relation to the industry in general and to government, that most attention is devoted in this chapter.

It must be remembered, too, that C.S.R. has big interests in sugar outside the Australian industry, in Fiji and New Zealand; and also has big interests in Australia altogether outside sugar, these being described in a later chapter.

Government Intervention during World War I

To understand the situation which controls the price of refined sugar to consumers and gives the Australian sugar industry an apparently powerful monopoly over the Australian internal market, reference must be made to its origins during World War I. Australia was not then self-sufficient in sugar and, until 1915, movements in the price of refined in Australia were dictated by the world market, with C.S.R. as the interpreter. There was an import duty of £6 per ton, on both raw and refined cane sugar; the company paid to Australian mills the world price, including freight to Australia, plus the £6, which therefore went in full to benefit millers and growers. As refiners, C.S.R. operated, in practice, without protection on a free trade basis. The mills purchased cane from the farmers at mutually arranged prices.

In 1915, because of the wartime inflation of the world market price, the Commonwealth Government, in agreement with the Queensland Government, imposed a prohibition on imports and exports, and took responsibility for purchasing from abroad sufficient supplies to make up internal consumption requirements. It also fixed the price to be paid to Australian mills for raw sugar. The Queensland Government passed its Sugar Acquisition Act to acquire all raw sugar as made by the Queensland mills, in order to hand it over to the Commonwealth.

The objectives were to protect Australian consumers, to prevent the export to high-priced overseas markets of sugar required in Australia and to afford protection to the raw sugar industry against the operations of Food Prices Boards.

For the remainder of the war and in the immediate postwar years, C.S.R. did practically all the work to carry out on behalf of the Commonwealth Government the payment to the mills for raw sugar and the feeding of Australia with sugar refined here from Australian and imported raws. In this period began the system which was adapted and continued in order to protect and assist the Australian *raw* sugar industry.

In 1915, the year when the Commonwealth Government fixed the price to be paid to Australian mills for raw sugar, the Queensland Government, in addition to passing the Acquisition Act, legislated to set up the Central Sugar Cane Prices Board to arbitrate between growers and millers on cane prices and allied matters. Years later, as over-production became a grave issue, great power (which was subsequently increased) was given to the Central Sugar Cane Prices Board to control the extent of cane acreage and its allocation to individual farmers, by refining and strengthening the licensing system known as "assignment", and to determine what raw sugar quotas, called "peaks", mills should be allowed to manufacture. Nowadays, in addition to the acreage, the quantity of cane or sugar per farm is controlled, so as to relate it to the mill peaks.

The Commonwealth Transfers Control to Queensland

In 1923 the Commonwealth Government handed over to the Queensland Government the machinery of control subject to certain undertakings. The position then created has changed little in principle or method. Broadly, the Commonwealth agrees to maintain an embargo on sugar imports, thereby reserving the whole internal market for Australian raw sugar, provided that the Queensland Government, acting on behalf of the *raw* sugar industry, sells *refined* sugar to the Australian public at prices agreed between the two Governments to be fair. The agreements between the Governments are generally for a five-year period and they have hardly altered in structure or purpose.

The purpose of these government actions was to protect, and to assist the development of, the raw sugar industry—in the permanent interests of the Australian nation.

The industry has come under full and detailed examination by special Inquiry Committees appointed at intervals by the Common-

wealth, in order to make sure that, having granted to the raw sugar industry sole rights to supply the Australian domestic market, the industry is developing the North, is free of "feather-bedding" inside the industry, is maintaining high standards of efficiency, and is making a reasonable profit.

The Company's Position in the Marketing Pool

A number of features of the marketing of Queensland raw sugar were not greatly affected by the Federal or State Government controls and were absorbed into the new system with little or no change. C.S.R. from back in the previous century had been contracting to buy the output of raw sugar from the Queensland mills. The contracts provided that the company would supply the mills with the sacks, would take over the raw sugar at mill port and pay freight and insurance from that point onwards, and would make advance payments for the greater part of the value of the raws as shipped—paying the balance at the end of the year when the final average price of refined for the year became known. These matters, even today, are features of the pool system and of C.S.R. functions. It is of interest that the company from the previous century had been varying the price to the mills for their raws on a sliding scale linked directly to the price of refined sugar (which had to compete with imported refined). All this amounted to a fairly complete C.S.R.-operated raw sugar marketing pool, not dissimilar in many respects from that now in operation.

The Queensland Government in 1923 had undertaken major and complicated responsibilities in its agreement with the Commonwealth. It continued to acquire under its Sugar Acquisition Act all raw sugar as made by the mills. Such acquisition obviously did not apply to raw sugar made in New South Wales. Also, since the Queensland Government had no jurisdiction over refineries outside Queensland, it had no direct means of carrying out its obligations to supply refined sugar.

The embargo on imports and the acquisition by the Queensland Government of all raw sugar produced in that State meant that the refiners had to get their raw supplies from that Government, except for the small quantity made in New South Wales. Importation would be refused by the Commonwealth if Australian raws were available.

These matters were handled by a contract between the Queensland Government and C.S.R. which has been renewed annually for 32 years with few changes of principle. Under this contract the company agreed to sell the New South Wales raw sugar (all made at its own

mills) to the Queensland Government, to refine the sugar required by Australian consumers, and to carry out for the Queensland Government in all States (except for the quantity to be handled similarly by the Millaquin Refinery) its obligation to supply the Australian public at the price agreed between the Governments.

Thus began the Australian raw sugar marketing pool, controlled by the Queensland Government through its Sugar Board, managed and operated by the Colonial Sugar Refining Company.

There was a new development in 1925 when a big increase took place in the quantity of raw sugar for export at a time when the export price had fallen heavily. The then Chairman, Mr E. W. Knox, said: "As a contribution to relieve the industry in its difficulties arising out of overproduction, the Company is willing to handle and finance the surplus sugar without charge for services and without interest." Although exports grew to more than half of total raw sugar production, this "contribution" continued until recently and still applies in part, but the financial burden of advances on export sugar became very considerable a few years ago and a charge for financing it is now made.

The company's remuneration for refining and selling home consumption sugar, for financing, for providing the bags, and for other smaller matters, is by fees expressed as rates per ton. There is therefore a direct incentive to increase the total tonnage sold in Australia. But, since the fees are not a percentage of sale proceeds, C.S.R. is not directly interested, in its capacity as refiner and seller, in the selling price of refined sugar in Australia. Since 1915 the refiners, contrary to popular belief, have not been consulted about price changes. The import embargo is operated for the benefit of the raw sugar industry—the millers and growers.

This bare outline provides the historical background to an unusually complex group of arrangements—but one which has withstood the test of time, of changing governments in Canberra and Queensland, of changing management in the company, of the big development of export sugar, and of greatly changed economic conditions. The strangest part of all to most people is the smooth-working partnership of the Queensland Government—Labour all the time except for three years—and twentieth-century corporate capitalism in the shape of C.S.R. Although the facts are clearly and publicly documented, the company's relations with the Queensland Government and the rest of the industry have been called an "enigma".

The clues to the mystery, if it be one, are found in a combination of various things. For instance, even if it did not relish the situation—

on which recorded history is silent—the company had to get raw sugar from the only source. That it was satisfied is indicated by its willingness to add the New South Wales raw sugar to the general pool. On the other side, unlimited power is not held by the Queensland Government, as the main refineries are outside the State.

A factor of importance has been that, while change and development can and do occur, hardly any suggestion has ever been made that the tried and proved business practices of the company should be seriously disturbed. In practice, C.S.R. continues to obtain sugar from the mills, paying for it, shipping, refining and selling it, as if there were little change. The Sugar Board has appreciated the advantages of not attempting to insert itself between C.S.R. as refiners and the company's customers. Because of this C.S.R. retains a full sense of responsibility and interest, a condition which is essential if men are to give continuously of their best creative efforts.

Queensland Governments have been vitally concerned with the welfare of the sugar industry, one of the most important in the State. They have been moderate and helpful and have had the marketing of sugar carried out to the satisfaction of themselves, C.S.R. and the raw sugar industry. The three Chairmen of the Sugar Board (W. J. Short, the Honourable W. Forgan Smith and P. J. Donnollan) have been far-sighted and possessed of deep personal interest in the welfare of the industry.

A most important element in the situation has been the company's great underlying interest as the largest millowner and therefore the biggest single participant in the results of the marketing pool. This has enhanced the feeling of responsibility and belonging, without which the attitudes on all sides could hardly have been quite the same. There is no other industry where all these circumstances would be duplicated.

The vital ingredients need emphasizing. First, C.S.R. treats work for the marketing pool as an integral part of the company's business and deals with it in the same commercial way as with the rest of its business. Secondly, C.S.R. staff are in a position to act with keenness, interest and responsibility on the basis that attention to and the success of the Sugar Board business is completely in the interests of the company; any suggestion that it is a thing apart or that they are being interfered with or are working for some other and remote interests would be extremely detrimental—and the Sugar Board has understood this. Thirdly, a high level of mutual confidence has been built and maintained between the board, the industry and the company.

Sugar Industry Organizations

The Sugar Board consists of four members: chairman, secretary, a miller and a grower, all appointed by the Queensland Government. The company was invited to have a representative but declined as it had to carry on business transactions with the board.

The Central Sugar Cane Prices Board has important functions in controlling the level of production and arbitrating between miller and grower. In addition to the chairman and two other government-appointed members, the growers and millers each have one representative on this important board. Officers of the company have been elected by the millowners to fill the position of millowners' representative ever since the board was founded in 1915. In New South Wales and Fiji, where C.S.R. is the only millowner, no similar authority has been required.

Space does not allow, in this book about the company, more than bare references to Australian sugar industry organizations; there are several important organizations in addition to the research institutions, whose work is mentioned elsewhere. The Australian Sugar Producers' Association is the older association, having been founded in 1907; its membership comprises, on a voluntary basis, all the millowners other than C.S.R., plus about half of the growers. The Queensland Cane Growers' Association, to which all Queensland growers are required by law to belong, was established by 1926 legislation to take the place of a previous voluntary association of growers. The New South Wales Cane Growers' Association consists of the growers in that State on a voluntary basis. The Proprietary Sugar Millers' Association has a membership covering millowners other than co-operative mills and C.S.R. Although the company is not a member of these industry associations it does support some of them financially and works with all on matters of mutual interest.

These organizations together with C.S.R. cover all phases of the industry and governments can and do get the viewpoint of the whole industry by consulting them. Students of social organization will notice a rather complete system of checks and balances. The Australian sugar industry has been said to be "almost completely socialized", but it is not. The profit motive continues to operate throughout. There is a large measure of control, which cannot be avoided where an industry works under complete protection by so sweeping a method as an embargo and where strict limitation of production is necessary by methods other than the sanction of unremunerative prices.

Monopoly

"Monopoly!" It is a telling label to tie on one's opponent in the hot debate, or with which to draw an emotional and political red herring across discussion—whether one tags it on a large business, a trade union or the government railways. Much is heard from numerous armchair analysts and publicists but little from the objective thinkers and researchers who have closely examined the full facts of monopoly situations in recent times. Only from the full details of industry, of union affairs, of government activity, can truth and fact about monopoly be ascertained; and appearances are often misleading. Wise policies for the public welfare are unlikely to develop from generalizations, or from verdicts which are derived from mere theory and do not stem from, and which are not kept constantly up to date with, the real and current facts; business and capitalism have changed and are still evolving.

"Madmen in authority," said J. M. Keynes, in a colourful moment, "who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back." And F. A. Hayek adds, "While we must emancipate ourselves from that servitude to current prejudices in which the politician is held, we must take a sane view of what persuasion and instruction are likely to yield."

The admonitions of these eminent men are relevant to the endemic disease of name-calling. "Monopoly", critics have said, "is rife in the Australian sugar industry." Some point to the selling monopoly which they say the well-organized industry holds over the Australian sugar market; others to the buying monopoly which mills are said to have in respect of farmers' cane; and still more to the so-called monopoly of C.S.R. in refining. Some point even to the Queensland Cane Growers' Association, which all growers must compulsorily join.

Although the dictionary meaning of "monopoly" seemingly applies in many of these cases, it is the economic power of monopoly which is really under fire, for the key to true monopoly is power. In economics and business it is power over market and price. Business means, in its fundamentals, buying and/or selling. Price is the crux of the matter.

It should be noted in passing that it has been deliberate government action which created three of these circumstances, viz. the reservation of the whole home consumption market for the local sugar industry, the compulsory organization of all Queensland growers by legislative action, and the removal, unsought by refiners, of overseas competition

from the refining industry, previously conducted on a free trade basis.

Some careful men have written on monopoly and they are agreed about its definition. Taking two only: Alfred Marshall, the eminent English economist, writing in 1920, and Edward Chamberlin, Professor of Economics of Harvard University, a world expert on monopoly, writing in 1948, both agreed that business monopoly means *control over price.*

To take into account other shades of opinion, reference may be made to the British Fabian Society, where one can expect to find the most exacting criticism of private monopoly, as distinct from that of governments or trade unions. In a special study of monopoly, published by the Society in 1947, W. Arthur Lewis makes these points:

> Monopoly is a deceptive phenomenon. The sole test of the existence of real monopoly power is the power to control prices. Many situations which look monopolistic are not, because effective control of prices is absent.
>
> When we speak of monopoly . . . we must seek to measure in each case how real is the power it confers.
>
> Most monopolies [in the United Kingdom] can be absolved of any charge of extortionate prices and profit.
>
> The conclusion that they restrict consumption is misleading.
>
> Many points can be made against monopoly but the two most important are that it is inefficient and that it is undemocratic.

From the description of the Australian sugar industry it will have been observed that wherever monopoly seems to exist, in respect of any part of the industry, there is a variety of strong checks and balances which reduce or eliminate "power", by definition the key to monopoly, and also that the seeming monopolists do not control the price. Therefore, according to modern definition of monopoly, outward appearances are misleading and effective monopoly does not exist.

In refining, the company has a competitor in Queensland which supplies one-third of the market there. C.S.R. is not even a party to the fixing of refined sugar prices, but merely sells its services. In that negotiation it has to come to terms with the Sugar Board, which has a complete buying monopoly, set up by statute and backed by all the powers of government, for C.S.R. services, with legal control over the company's raw material. It is not a particularly comfortable "monopoly" that the embargo imposed, unsought, on the refiners.

As to the residuum of criticism, even by such severe critics as the Fabian socialists, against private monopoly—"that it is inefficient and that it is undemocratic"—no one in the sugar industry (even if by true definition it does contain any elements of monopoly) would feel disturbed. And the reader may judge for himself from the facts.

What People Think

A situation which is as complex as the one just described will never be understood in detail by a majority of the people. Nevertheless, people have a habit of forming opinions and it is of interest to find what these opinions are. C.S.R. has therefore had carried out, by competent organizations of high repute, surveys on the opinion of the Australian public about the company. Several of these surveys have been made in the last nine years.

They have covered samples of men and women scientifically chosen to represent the community. Neither the people who did the interviewing nor those interviewed knew who had asked for the survey and the company's particular interest could not be guessed because questions were included on eight other major industries and organizations. The techniques used were the best applicable in this particular field.

Surveys of this kind are fairly accurate but it would not be claimed by the organizations making them, nor by the company, that they are precise to the exact percentage shown by the mathematical distribution of the answers.

The latest such survey was made in 1955 by Opinion Research Centre (Gallup Poll). The first question covered the political question of nationalization. The proportion in favour of C.S.R. remaining as a company, instead of becoming a nationalized industry, was 77 per cent; 11 per cent had no opinion and only 12 per cent were in favour of the Government taking over the company.

It is a point of considerable significance that such a high proportion of the people had a definite opinion; it shows the interest that exists in big companies. Excluding the small number (11 per cent) with no opinion, 87 per cent of those with an opinion were in favour of the company. The survey also showed another significant thing—that the public differentiates between various companies and industries, and is more in favour of government intervention in some than in others. Comparatively, as well as absolutely, C.S.R. stood quite high in public opinion.

In answer to another question 50 per cent of the people regarded

C.S.R. as a monopoly, a similar proportion had the same opinion about the Waterside Workers' Federation and the state-owned railways. Only one out of ten, however, thought that C.S.R. uses its "monopoly" unfairly, while two out of ten said that the railways are unfair, and more than three out of ten said that the Waterside Workers' Federation is unfair in applying its monopoly.

Only about one person in twenty-five said that C.S.R. is not well run, and only one in twenty-five said that the company does not have a good reputation.

While opinions may not reflect facts, and facts could be favourable even if opinions were not, public opinion is important in a political democracy. It is gratifying to the company that the public does not hold unfriendly feelings towards it and that its reputation is high. Readers of this book will have more information than the public on which to form their own opinions.

PUBLIC ATTITUDES TOWARDS C.S.R. IN AUSTRALIA, 1955

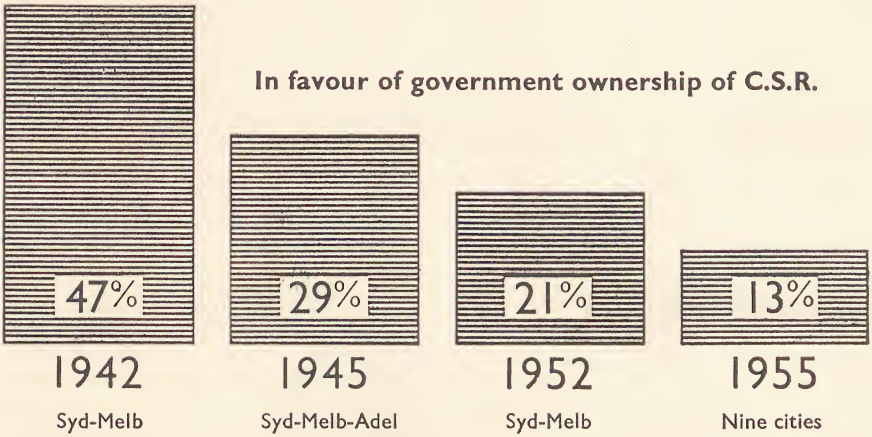
Main findings of a survey carried out during March and April 1955 by Mr Roy Morgan of Opinion Research Centre (Gallup Poll), Melbourne, in Sydney, Newcastle, Melbourne, Geelong, Brisbane, Adelaide, Perth, Hobart and Launceston.

Ownership. Each person interviewed was handed a card listing nine major companies, industries, or groups of industries, and asked: "We'd like your opinion on whether large industries, like these, should be owned and run by the Government, instead of by companies".

77% favour the company continuing to own CSR — 10% no opinion — 12% Govt. — 1% both

In answering this question the public differentiated quite clearly between various industries. Three industries—large city stores, city newspapers, and a medium-sized food industry—scored higher majorities than C.S.R. for company control; others scored considerably lower; C.S.R.'s score was above the average.

Trends of Opinion Regarding Government Ownership. The results of this survey compared with previous independent surveys of opinion in Australian cities show that over the last 12 years the proportion of the public in favour of government ownership in industry has been decreasing. Those in favour of government ownership of C.S.R. have declined from 47 per cent in 1942 to 13 per cent in 1955, including 1 per cent favouring joint ownership as shown above.

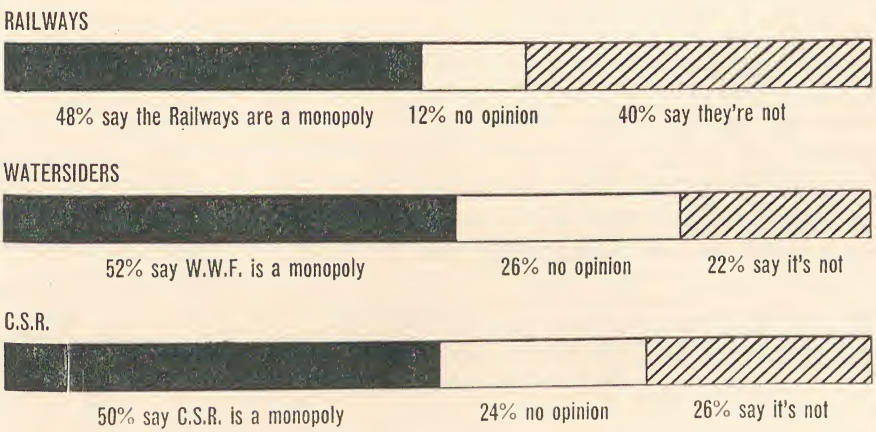


Reputation of C.S.R. Each person interviewed was asked to give an opinion of the reputation of various organizations. "*And the reputation of C.S.R.—do you think it's good, or not?*"

Only one person in twenty-five held that C.S.R. does not have a good reputation. C.S.R. had one of the lowest figures for poor reputation. Three out of four people hold the positive opinion that C.S.R.'s reputation is good.

Monopoly and Fairness

Question: "*Would you say that the railways are a monopoly or not? The Waterside Workers' Federation? The C.S.R. Co.?*" (*and some others*).

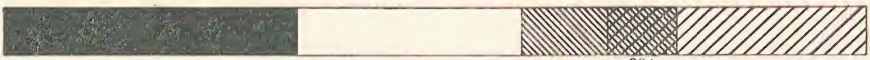


Question: *For each organization named as a monopoly interviewers asked: "In your opinion does* (ORGANIZATION) *use its monopoly unfairly, or not?"*

RAILWAYS

18% say railways unfair monopoly | 12% no opinion re monopoly | 22% say railways fair | 8% uncertain re fairness | 40% say railways not monopoly

WATERSIDERS



34% say W.W.F. unfair monopoly | 26% no opinion re monopoly | 10% say W.W.F. fair | 8% uncertain re fairness | 22% say W.W.F. not monopoly

C.S.R.

9% say C.S.R. unfair monopoly | 24% no opinion re monopoly | 30% say C.S.R. fair monopoly | 11% uncertain re fairness | 26% say C.S.R. not monopoly

Chelsea Refinery, Auckland, New Zealand.

CHAPTER 10

Sugar in New Zealand

A. C. ISAACS

This chapter deals with some matters of direct interest to New Zealanders. It is short because many subjects which relate to sugar in New Zealand have been covered in the rest of the book. The historical background of the New Zealand sugar refining industry, the procurement of raw sugar for New Zealand, the technology of sugar refining, and the ownership of the C.S.R. Company are dealt with in other chapters.

Mr A. C. Isaacs is C. S. R. manager in New Zealand. He is a graduate of Sydney University and held a senior position in the sugar marketing division at the company's Head Office before his present appointment.

March 1956

Chelsea Refinery, 1885, shortly after it was built.

THE history of Chelsea Refinery goes back to 1881, when Edward Knox, chairman of the Colonial Sugar Refining Company, Sydney, visited Auckland with a proposal to establish a refinery there. At that time all New Zealand's refined sugar was imported from Australia, Mauritius and other countries.

During his visit Mr Knox purchased as a site for the new factory 160 acres near the new suburb of Birkenhead, across the water from the city of Auckland. The site had a deep water frontage to Waitemata Harbour. Two years later, in 1883, the New Zealand Sugar Company Limited, in which the Colonial Sugar Refining Company, the Victoria Sugar Company, and a group of New Zealand investors held equal shares, was registered in Auckland. The C.S.R. Co. built the refinery for the new company. Before any building could be done 120,000 cubic yards of clay had to be removed; 1½ million bricks were made from this clay for the buildings and for the construction of two dams across Duck Creek, which ran through the company's property and which was to be the source of the refinery's supply of fresh water. Two long wharves were run out into the harbour; the bottom was solid rock and the holes for the piles had to be blasted. The refinery was completed within 18 months and commenced operations in September 1884. For some years its weekly production of refined sugar was less than 150 tons, compared to its present capacity of more than 2,000 tons per week, or more than 100,000 tons a year.

During the period 1887-1888, the Colonial Sugar Refining Company,

the Victoria Sugar Company and the New Zealand Sugar Company Limited amalgamated and formed the Colonial Sugar Refining Company Limited operating in Australia, New Zealand and Fiji. Although the New Zealand Company merged with the Colonial Sugar Refining Company Limited, New Zealanders have always been strongly represented as shareholders. An analysis in 1954 of C.S.R. shareholders showed that 2,609, or 21 per cent, were domiciled in New Zealand.

Since the amalgamation the Colonial Sugar Refining Company Limited has had the valuable assistance of a New Zealand board of advice, consisting of several New Zealanders who are shareholders in the company. This board helps the company to keep informed of the trend of New Zealand business affairs and is available for local advice as required.

In the early days before New Zealand had its own refinery, imports of white sugar came mainly from Australia and Mauritius. When the refinery started operating, imports of refined sugar practically ceased. Until the first World War raw sugar was imported from Java and Fiji. From 1914 to 1920, years of world sugar shortages and high prices, the C.S.R. Company supplied New Zealand from Fiji with raw sugar at prices substantially lower than paid by the United Kingdom, and much lower than the company could have obtained had it sold the Fiji raws elsewhere. In 1919 the New Zealand Board of Trade acknowledged that the company in the arrangement entered

From left: Mr A. C. Isaacs, C.S.R. manager in New Zealand, with Messrs R. P. Towle and R. D. Horton, who comprise the New Zealand board of advice to the company.

Chelsea Refinery is on the northern side of Auckland Harbour, close to the suburb of Birkenhead. The artificial lakes behind the factory provide fresh water for the refining process. Many native New Zealand trees and ferns have been preserved in their natural environment in the 300 acre catchment area. The overseas ship on the left is discharging raw sugar. The jetty on the right is for the passenger ferry service by which many of the refinery employees travel to and from work.

into with the New Zealand Government since the war began "ignored the market value of sugar in determining the price with the result that the Dominion's consumers have been able to purchase their requirements cheaper than those in any other country".

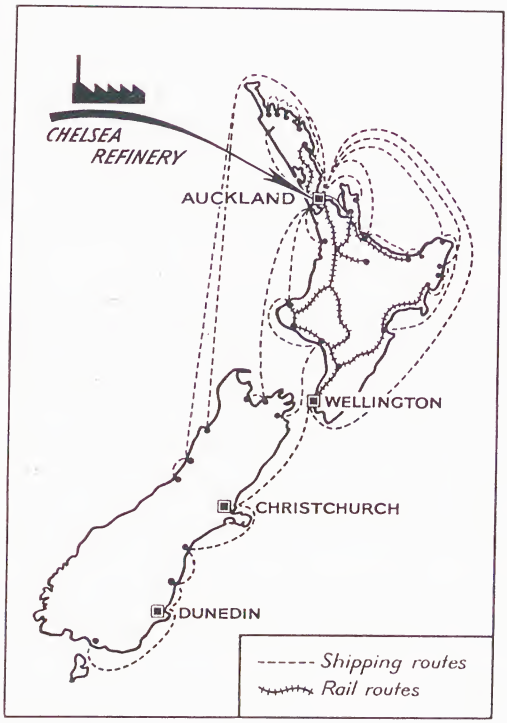
From 1920 to 1939 New Zealand raw sugar imports were bought mainly from Java, Cuba, San Domingo and Peru, i.e., the cheapest available world sources. However, raw sugar from these sources was sure to become very dear in the event of a major war and probably scarce and difficult to obtain. In the first week of World War II the company arranged to ensure that New Zealand's requirements of raw

Unloading imported raw sugar at Chelsea.

sugar would be supplied from Fiji. Soon afterwards, as part of the general wartime British Empire sugar arrangements, provision was made for the company to supply New Zealand from Fiji and Australia by subtraction of New Zealand's requirements from the bulk purchase made by the British Government of all British Empire sugar exports. The sources of supply of raw sugar for refining by the company at the Auckland refinery are shown in Appendix 25.

In 1950 the New Zealand Government agreed with the United Kingdom Government for 75,000 tons of New Zealand's raw sugar requirements to be purchased annually at the same price as that negotiated with the U.K. Government by British Commonwealth producing countries under the British Commonwealth Sugar Agreement. The company buys the rest of its requirements as cheaply as it can from world sources. At the time the price of foreign raw sugar was substantially higher than this negotiated price, but the recovery of world sugar production and the overtaking of shortages has now reversed the position, and the negotiated price for Commonwealth cane sugar

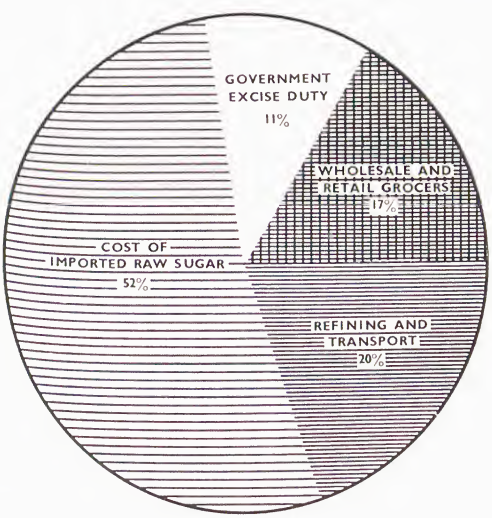
DISTRIBUTION OF REFINED SUGAR IN NEW ZEALAND



Reserves of refined sugar stored at Chelsea Refinery. More than half of Chelsea's output of refined sugar is transported by sea, going to 32 separate ports from Awanui in the north to Bluff in the south. Wholesale distributing agents in southern centres, under special arrangements with the company, carry reserve stocks for use in the event of shipping delays or stoppages. Transport costs are a significant item in the price of refined sugar in New Zealand.

has been higher for several years than that of the world free market. This policy of the New Zealand Government in associating itself with the United Kingdom Government has meant that New Zealand has paid in recent years higher prices for raw sugar and consequently the price of refined sugar has been higher. Manufacturers who have had to face competition from overseas goods containing cheaper sugar have been critical of this policy, and also of the Government excise tax of a penny per pound weight on sugar refined in New Zealand.

Self-service food store, New Zealand.



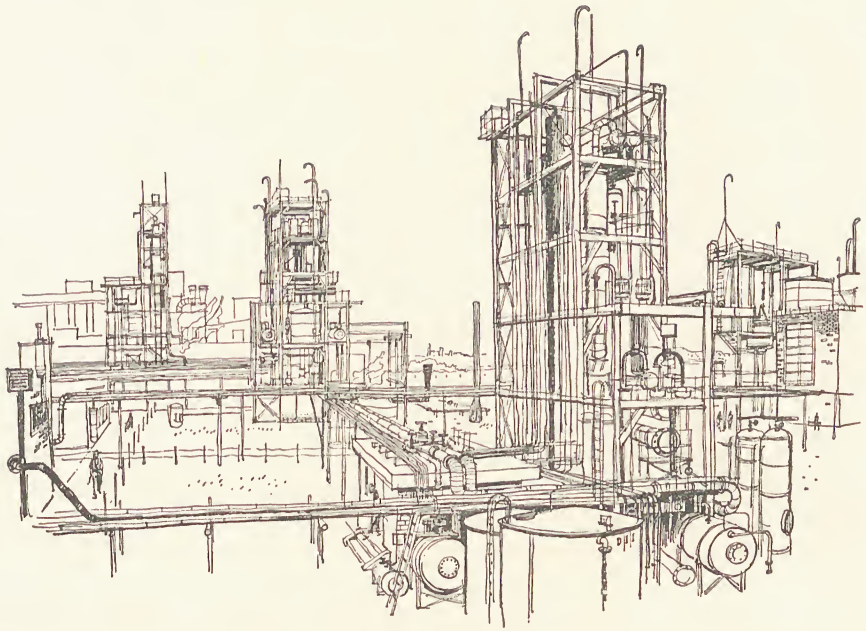
Distribution of retail price of refined sugar in New Zealand.

A little over half of every penny spent on buying refined sugar goes in payment for raw sugar and for sea freight in bringing it to New Zealand. Refining the raw sugar, transporting refined products and distributing them through the grocery trade account for about one third; a considerable slice is taken by the Government in excise duty which is levied at the rate of a penny per pound weight on all sugar delivered. Last year over £800,000 in sugar duty was paid to the Government. This is in contrast to other basic foodstuffs such as bread, butter, milk, flour and eggs, all of which are subsidized by the Government. Subsidies voted for the year ended 31 March 1956 are as follows:

Butter	£4,800,000
Eggs	£ 246,000
Milk	£2,965,000
Wheat and flour (to maintain price of bread and assist growers)	£3,600,000

Sugar is *not subsidized* but taxed by the Government, yielding in revenue over £800,000 a year.

C.S.R. employs over 400 people in New Zealand. *Right:* Employee's house at Chelsea built about 1884 when the refinery was built. *Below:* A privately-owned home of an employee built with the help of the company's house advance scheme.



CHAPTER II

Widening the Field

CLIVE TURNBULL

The survey of C.S.R. activities in the production and marketing of sugar is now complete. But there is a major group of activities yet to be described in the chemical and building materials industries. These are relatively new fields of production for the company and their relation to the sugar industry is not obvious. They have grown to an extent and with a speed which are striking and of significance for the future. This chapter examines the motives which guided the expansion into these wider fields, the organic connection of these developments with the sugar interests, the problems encountered (some of which still have to be overcome), and the magnitude of the achievements.

Mr Clive Turnbull was invited to report on these newer ventures. He is a well-known, independent writer from Melbourne, one of whose interests has been to study and describe the growth and operation of Australian industries.

September 1955

Sugar today is not only a foodstuff. Sugar is the basis of a group of industries as yet so new that by most people their extent, in some cases even their existence, is scarcely realized. Thus it would surprise the average Australian at breakfast to realize that the company which provided the sugar that he has just put into his tea also produces enough building material to cover the inside and outside of a quarter of the 80,000 houses which Australia builds each year. He would be surprised, too, to realize that the same company provided part of the raw material of the aspirin in his medicine cupboard and of the paint (as he would call it) on his refrigerator. "What have these things to do with sugar?" he might ask, "Have building materials and chemicals any connection with the cane fields of Queensland and northern New South Wales?" The answer is "Yes. These are logical developments."

Businesses, if they are successful and efficient, follow a consistent pattern of development, aimed at the profitable use of the whole of the basic raw material. There are many instances, the simplest summed up in the old joke that the Chicago meatworks use all of the pig but the squeal.

It is apparent that a big business seeking ways of expansion will be interested in certain kinds of development adapted to its character and capacity. Thus it will not generally be interested in small-scale batch production suited to small enterprises but it will be interested in mass production by continuous processes. Such processes usually demand large capital expenditure and a high degree of "know-how", and therefore their development has generally to await the interest and attention of large companies. Because these ventures are costly, because they take a long time to start and an even longer time to become profitable, it is obvious that they must be of the kind which can take a natural place in an expanding national economy, neither too soon nor too late. When the time, the place and the raw material are perfectly matched is the moment to move. Traditionally, expansion of C.S.R. interests has been with solid, basic lines of permanent value to the community. Opportunistic or short-lived products and luxury lines have been avoided.

A look at the situation in the twenties and thirties shows how these forces acted in Australia. Megass, the fibre which remains after the sugar cane has been crushed, is used in firing the boilers of the sugar mills but sometimes its production outruns need. In mills in northern New South Wales there is normally a surplus of megass towards the end of the crushing season; but even when there is not a great surplus the megass is worth only the cost of enough coal to replace it. When both coal and transport were inexpensive megass from northern

New South Wales was available at low cost. A second by-product, molasses, had been used since last century as the raw material of industrial and potable alcohols in the company's distilleries.

In the late twenties and early thirties all these matters had long consideration. Large-scale expansion of sugar production, as such, in Australia or Fiji was not feasible because markets were then saturated. The company had even explored the possibility of entering the industry in other countries, such as India, but for various reasons it decided not to do so. Expansion by a diversification of interests through improved use of the by-products, megass and molasses, appeared to be the logical procedure. How these aims were eventually realized it is the purpose of this chapter to describe.

There is no theoretical difficulty in making use of megass as a raw material. Vegetable fibres have been used for centuries in making paper and, in more recent times, cardboard. Although it was apparent that it was possible to use megass for a variety of purposes, the immediate question which faced the company in the twenties was whether it was the basis of any product which would command a long-term market, justifying the high initial expenditure.

Developments in the United States pointed the way. Builders were demanding a wallboard of light weight at least 6 ft. to 8 ft. long and 3 ft. to 4 ft. wide. Such a board would facilitate building and meet the demand for more homes, factories and offices, a demand which increased with the lifting of the depression. Boards of this size could not be obtained from sawn timber but overseas manufacturers were making them in factories from fibres of softwoods by a process akin to that used in the manufacture of paper and cardboard. Australia lacks softwoods and twenty-five years ago no one had succeeded in using the short-fibred Australian eucalypts commercially for any such purpose. The company's officers, however, had noted that some overseas manufacturers were using sugar cane fibres to make their wall boards. Here, then, was a potential use for the Australian market; it remained to be determined whether it was also economically practicable.

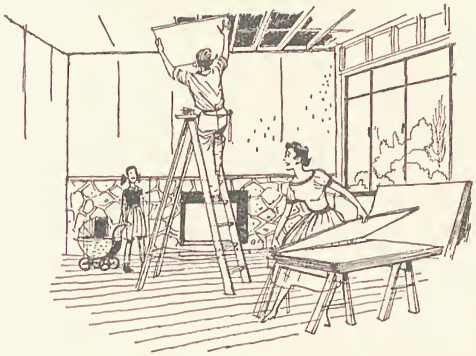
A survey of the Australian market demand for wallboards (which had been imported from the United States in small quantities from 1930 onwards) showed that from 10,000 to 15,000 tons of cane fibre would be needed yearly as raw material if the industry attained the per capita consumption of the United States. The fibre was available and it was decided to proceed with the project. After further study of overseas development the company erected a small pilot plant at Macknade Mill in Queensland in 1936. This plant pulped megass

and made wallboard by a batch process which gave sufficient information for the company's technicians later to design a continuous process for a factory. The pilot plant operated for a couple of years on a semi-commercial scale. Both insulation board, similar to present-day "Cane-ite", and hardboard, similar to "Timbrock", were manufactured in 7 ft. by 4 ft. sheets and sold to the building trade in Queensland and New South Wales. At the same time intensive investigation took place in the central research and design departments in Sydney.

In 1937, having acquired a good background of laboratory research, practical operation of a pilot plant, and understanding of market requirements, C.S.R. sent two officers of the company to study the large-scale manufacture of wallboard in the United States, in England and on the continent of Europe. Information from all these sources was pooled and studied. Upon this basis a large factory was designed and erected at Pyrmont on the Sydney harbour-front, adjacent to the company's refinery, distillery and central workshops. The plant for this factory, with the exception of some very specialized equipment, was made in Australia. In 1939 it began production of the low-density wallboard known as "Cane-ite" at the rate of 10,000,000 square feet per annum. Today it can produce 40,000,000 square feet per annum.

All contingencies had been provided for—except the inevitable hazards of economic change. In the years since 1939 the Australian cost structure has altered radically. Coal is now four times its price in 1939. Transport costs between Sydney and the northern New South Wales sugar mills have risen even more steeply. Megass is therefore in great demand as mill fuel and consequently is no longer as attractive as it was as a raw material for building boards. Because of this much research has been done to find other raw materials and today, to keep costs to a minimum, "Cane-ite" is made from a mixture of megass, special grades of waste paper, and pulp made from inferior types of Australian eucalypt trees which have no other economic use. Because of these technical developments and despite the heavy increased cost of the raw material—megass—on which the industry was based, "Cane-ite" today, at double its price in 1939, has retained a favourable position in the building industry's cost structure. Plaster, asbestos cement, fibrous plaster and Portland cement are more than two and a half to three times their 1939 price; bricks and plywood are three to four times their 1939 price.

In all about £585,000 has been spent on the "Cane-ite" project and the venture has been successful. It has been successful because it was a logical development; the company had the "know-how"



C.S.R. BUILDING MATERIALS MADE IN AUSTRALIA.

"CANE-ITE" Wallboard.

Made largely from megass, which is the fibre left over when the juice has been crushed from sugar cane.
Used as an insulating interior wallboard. Sold in standard-size, white-ant proofed sheets, with a variety of finishes.

"TIMBROCK" Hardboard.

Made from Australian scrub eucalypts and other local hardwoods not normally suitable for the building trade.
Used for interior walls and fittings. It is flexible, grainless and splinterless, and is supplied in a variety of lengths of 4′ 6″ width.

"GYPROCK" Wallboard.

Made from a core of aerated gypsum plaster sandwiched between layers of special tough-fibred chipboard.
Used for interior walls and ceilings where its strength, smooth surface and ability to make a completely flush joint are an advantage.

"FIBROCK" Building Products.

Made from white and blue asbestos, the latter mined by Australian Blue Asbestos Ltd. in the Hamersley Ranges of Western Australia.
Used for corrugated roofing, guttering and down-pipes, flat exterior wall sheets, exterior wall sidings and accessories.

"CANE-ITE" ACOUSTI-TILES.

Made in 12-inch squares from "CANE-ITE". Each tile has 484 small holes in its surface to absorb sound.
Used on the walls and ceilings of offices, shops, factories and telephone booths to reduce noise. The tiles are easy to fit and attractive in appearance.

C.S.R. FLOOR TILES.

Made in 17 colours to allow an almost unlimited variety of combinations. A flexible floor tile *Vinylflex* made from vinyl plastic has recently been introduced in Australia.
Used where a fresh modern effect is required, or where traffic is especially heavy in shops, theatres, factories and offices.

C.S.R. BUILDING PLASTERS.

Made in N.S.W. by Concord Plaster Mills and in Victoria by Brunswick Plaster Mills from locally-mined gypsum.
Used for the making of fibrous plaster sheeting by many small manufacturing organizations. Also used by plasterers for special effects.

and the capital to carry it through; a market potentially existed and has been successfully established.

This was the beginning and thus the company entered the building materials business, perhaps the most highly competitive in Australia. When the "Cane-ite" factory was erected it had been decided to manufacture only insulation board and not to proceed further with the manufacture of the hardboard developed at Macknade because the Masonite Corporation of America was sponsoring the erection of a hardboard factory at Raymond Terrace, near Newcastle. C.S.R. undertook the sale and distribution of Australian Masonite and this arrangement continued for five years.

With a sales organization set up to sell "Cane-ite" and hardboard throughout Australia it was natural that the company should seek other types of basic building materials to make and sell. An Australia-wide sales organization is expensive and the more products that can be sold by the same sales force the cheaper the selling overhead becomes per unit. The more lines of the same type handled by the same sales organization the better pleased is the prospective customer who can perhaps order from one source much of the material he requires.

It was realized that the building trade, despite its basic nature, is liable to severe fluctuations in demand for various products. To guard against this American manufacturers commonly follow a policy of producing a number of complementary materials—internal and external linings, roofing materials and floor covering, for example—and the company kept this aspect firmly in mind. The wisdom of such a policy has become apparent in recent years when, despite a drop in demand for one or other of the Building Materials Division's products, the total sales volume has steadily increased, as shown in the accompanying graph of sales volume.

Among other materials investigated were a fireproof asbestos cement board and a plaster wallboard of the type very popular in the United States and known there as gypsum wallboard. The gypsum wallboard (now marketed as "Gyprock") had its immediate origins in the needs and shortages of World War II. Despite the priorities they enjoyed the Army and the Allied Works Council both suffered by reason of the acute shortage of building boards of all kinds. American army authorities, accustomed to the use of gypsum wallboard, proposed to Commonwealth officials that it be manufactured here. Officers of the company who had been overseas had observed that in the United States this board had superseded others and that it was the cheapest wallboard there obtainable. When the American suggestions were

supported by the Allied Works Council the company decided upon the construction of a plant at Concord, a suburb of Sydney.

The company had, in fact, decided some years earlier that when the time was ripe it would manufacture gypsum board in Australia and as a beginning had concentrated on obtaining the raw material, gypsum, needed to manufacture plaster. Leases were taken up throughout New South Wales. A plaster mill was erected in 1941 and the gypsum was processed for the manufacture of plaster of Paris for sale to the building trade and for other special purposes; thus plaster was already being manufactured and marketed while the wallboard factory was being designed and erected. Although plant and equipment for a gypsum wallboard factory could normally have been obtained from the United States it was Commonwealth policy during the war to import as little plant as possible. The company therefore designed and built the whole of the necessary equipment itself.

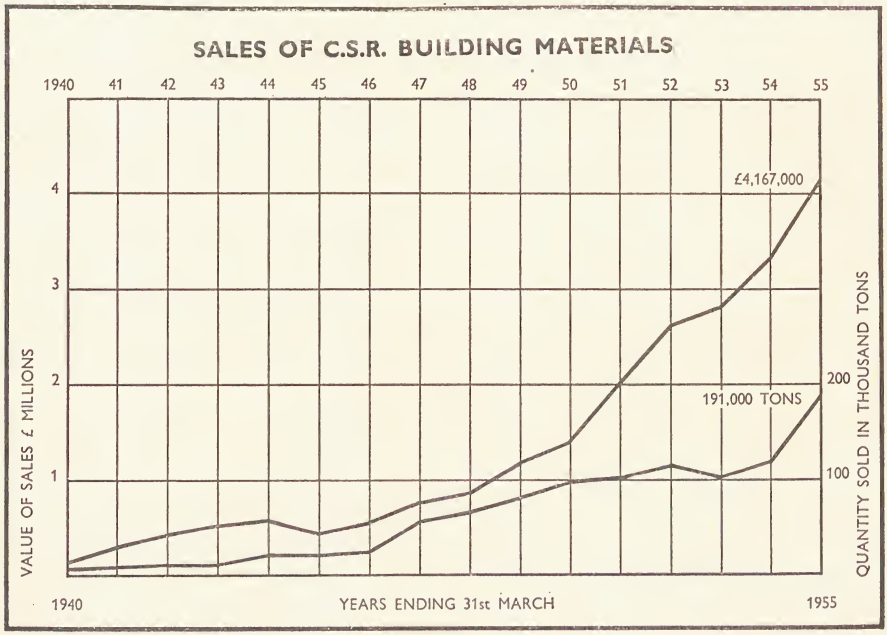
By making "Gyprock" the company has helped to develop Australian raw materials—gypsum for the inside of the board, wood pulp for the paper surfaces. To date, however, "Gyprock" has not been in such keen demand as have some other building boards—a contrast to experience overseas where similar gypsum wallboards are the most popular of all, partly because of their strength, rigidity and flame-proof qualities and particularly because of their low cost. The cost in Australia will decrease with the increased production which will follow demand as the building trade becomes more accustomed to the use of the product. Meantime the plaster side of the business has been successful and sales have steadily increased. A successful plaster business has also been built up in Victoria.

About the time that the company began to take an active interest in gypsum wallboard it also became interested in other types of fire-proof board and so turned its attention to asbestos cement products. On this occasion a small asbestos cement plant was bought as a going concern and developed by the company's engineers.

The heart of the manufacturing problem in this case is the supply of asbestos, for the other materials are readily available in Australia. When the company first became interested in the project Australia imported all her requirements of asbestos, 15,000 tons per annum, from Canada and South Africa. Concerned that such an essential raw material had to be imported, the company set out to see whether a suitable fibre could be obtained locally. In making asbestos cement, the asbestos fibre is mixed with Portland cement and water and later the water must be drained and pressed from the mixture. The fibre used must, therefore, drain easily. Three main kinds of asbestos are

used in Australia: blue crocidolite asbestos, which is long-fibred, drains readily in the manufacturing process, and is very strong; white asbestos, which is short-fibred, drains poorly and is slightly weaker; and amosite asbestos, which is short-fibred, drains well but is weak and is the cheapest of all asbestos fibres.

The company's inquiries led first to Tasmania and there it took leases of asbestos deposits. In these leases it mined a short-fibred white asbestos. But production ceased after the war as the deposits were not extensive—indeed, there are no known large deposits of white asbestos in Australia (though there are a considerable number of quite small deposits) and there are no known amosite deposits at all. There remains blue asbestos or crocidolite which occurs in the Hamersley Ranges in Western Australia and, in particular, at Wittenoom Gorge, 700 miles north-east of Perth and 100 miles south-west of Marble Bar, a place legendary in Australia for its extreme heat and its isolation from the rest of the continent. It was to this forbidding area, with mere tracks leading to it, that the company turned. The



Sales of the company's building materials have steadily risen since the company entered this field. The increase in value of sales has been substantially influenced by monetary inflation. But total sales expressed in tons (arrived at by adding together tonnages of the several kinds of building materials) show a steady overall increase in physical quantity of products sold.

development of the area is one of the romantic stories of industrial enterprise and, incidentally, a very considerable contribution to national wealth in strategic minerals.

The story of Wittenoom asbestos deposits begins with early prospectors, the lone and hardy pioneers of many mineral fields, picking at outcrops of asbestos. The method of occurrence itself is odd. The asbestos occurs in horizontal veins averaging half an inch in width, though sometimes measuring as much as two inches. Several of these veins occur over a total seam height of two feet. The economic mining of such a narrow horizontal seam in extremely hard rock was a new problem for Australia.

Here, then, was the first problem to be solved. Company officers in a world-wide search for a suitable mining technique visited iron mines in Alabama, silver-lead mines in Canada, asbestos mines in Rhodesia and diamond mines in South Africa. They adapted to Wittenoom conditions the various techniques examined. The company brought mining consultants from America. It brought Canadian and American shift bosses on a short-term basis to instruct the miners in the details of the methods to be used. The company could not get sufficient Australian miners to go to this isolated spot and, when the war was over, miners were brought from Italy, Holland, Austria and other countries to make up the numbers needed.

In the beginning there was no town. Transport and communication facilities were poor. Much of the early equipment had to be flown from Perth, 700 miles away. Even today transport is not easy. Stores normally come from Perth by sea to Point Samson, the port of Roebourne. Thence trucks take the stores 200 miles south-east to Wittenoom. Dry weather roads connect to Roebourne, Port Hedland, 150 miles north, Marble Bar, 100 miles north-east and Meekatharra, a railhead 300 miles south. There is an airmail to Perth three times a week and urgent messages may be radioed to Port Hedland for relay by telegraph to Perth.

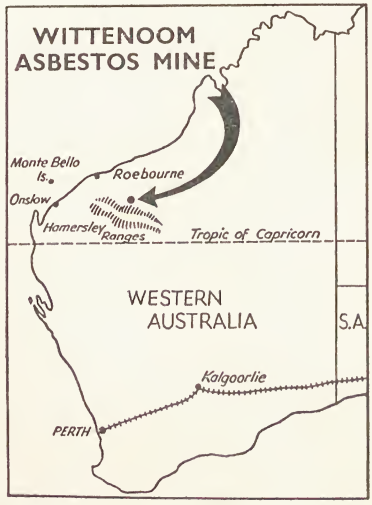
The original settlement was in a narrow gorge near the mine and the mill. Later it was replaced by a second settlement, seven miles away on the tableland outside the mouth of the gorge. Today this is the town of Wittenoom, largest inland town in the north-west and completely dependent on the blue asbestos industry. Largely built by the Commonwealth and Western Australian Governments, which recognized the importance of the industry and sponsored its early development, its present population is about 750, of whom about 200 are children. The people of Wittenoom have all the facilities of civilization—electric light, running water and septic installations for their homes, a large

general store, a cinema, cafe, hotel and school. There are tennis courts equipped for night tennis, a recreation room, a racecourse and sports ground, a modern hospital, a bus service to the mine and a regular air service to Perth. Such is life in the outback today when large national development makes necessary the provision of such naturally expensive amenities.

The Wittenoom ore is processed in a mill near the mine and blue asbestos is separated by blowing processes. The product is a strong, free-filtering fibre used by asbestos cement manufacturers to mix with white asbestos fibre. Certain industries use it for its chemical resistance. Thus the battery case in a car may be made from short blue asbestos fibres held together with plastic resin.

The operating company, Australian Blue Asbestos Limited, in which C.S.R. has a 97 per cent shareholding, is increasing the output of the mine and developing a market in competition with such countries as South Africa, which produces 30,000 tons of blue asbestos per annum largely with coloured labour, and Canada, which produces 1,000,000 tons of white asbestos. With steady progress at Wittenoom the cost per ton of the Australian fibre has been halved and additional increase in production will reduce the cost still further. The present aim is an output of 8,000 tons per annum but the deposits are of such extent that, once the industry is firmly established, output could be increased to 30,000 tons per annum or more if necessary.

The situation is not without difficulty, however. The use of Australian



LOCATION OF WITTENOOM

The Wittenoom Gorge asbestos mine of Australian Blue Asbestos Limited is located in the Hamersley Ranges of Western Australia, north of the Tropic of Capricorn.

blue fibre has not yet been accepted by the older-established asbestos cement manufacturers in Australia and the industry has had to depend largely on sales to overseas markets developed during the visits of company officers abroad. The local blue fibre is at present dearer than the particular grades of imported fibre used in Australia and the asbestos cement industry generally does not consider that it should use the Wittenoom product at higher cost although, with the increased production made possible by such use, the price could be reduced to that of comparable imported fibre. After all other means of encouraging local use of Australian blue fibre had been tried, application was made to the Tariff Board in June 1954 for protection by a duty on imported fibre. The company proposed that as long as consumers in Australia used local blue fibre to the extent of 15 per cent of their total usage of asbestos no duty be applied on any asbestos fibre imported, but that, failing this, a protective duty of 40 per cent should be applied. As Australia now obtains from abroad slightly more than 30,000 tons of fibre per annum this proposal would mean that Australia would use about 4,000 tons of blue fibre per annum. It is estimated that the protection requested would increase the cost of asbestos cement products by about 3 per cent only.

The Tariff Board Report tabled in Parliament in September 1955 recommended, however, that no assistance be granted to the industry as it considered the extra cost to Australian industry unjustified and considered protection by the method suggested to be "coercive". It appeared that the Tariff Board made its recommendation without taking account of such matters as the development of a remote area of Australia, the strategic and defence value of the industry, and the benefit to the overseas trade balance given by export of blue fibre and by the saving in imports if local blue asbestos fibre is used in Australia. During the calendar year 1955 sales of blue asbestos fibre to Europe and the United States will amount to 8,000 tons and the credit to the overseas trade balance will be £800,000, almost half of this being in dollar currency.

Irrespective of dollar-earning and contributions to the national stocks of raw materials, all industry, of whatever size, in Australia's north is strategically important. Thus the portion of Western Australia north of the 26th parallel, usually referred to as the North-West, has an area of 527,000 square miles and a total white population of only 8,400. Of this total 2,700 are in the coastal town of Carnarvon on the 25th parallel, leaving only 5,700 in the main north-west area. Wittenoom has become the largest inland town in this area with a population of 750. The asbestos fibre industry has also re-established

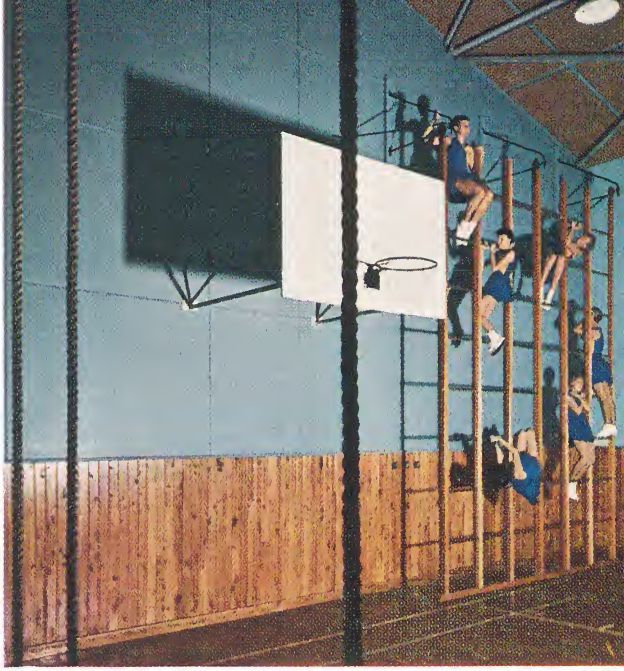
the important but lately moribund centre of Roebourne with its port at Point Samson. Shipping services and air services have derived increased revenue. Asbestos production—even at its present stage of development—is directly responsible for 900 additional residents, an increase of about 17 per cent in the population of the main north-west area. Though the figures are small in themselves, these are significant contributions towards solving a national problem. Perhaps it is appropriate that the sugar industry, on which the integrity of north-eastern Australia depends, should have done its share towards the development of the north-west area. By the decision of the Tariff Board, however, continuation of this industry in the North-West will be dependent on finding adequate export markets for the blue fibre produced, while Australia continues to import fibre from abroad to a total value of £3 million per annum.

The company's own present use of asbestos is in a wide range of asbestos cement products ("Fibrock" sheeting, sidings and roofing) and in various types of floor tiles including "Vinylflex", a vinyl floor covering previously almost unknown in Australia though popular in the United States and England for a number of years. These tiles, manufactured at Concord, Sydney, are used in shops, offices, factories, hallways, vestibules, theatre entrances, restaurants and homes. In developing their manufacture, C.S.R. leaned heavily for "know-how" on one of the largest manufacturers of building materials in the United States, the Johns-Manville Corporation, with which the company has long had friendly associations.

While the asbestos mining venture makes a colourful story and has interesting and important national implications, it forms only a small part of the company's overall operations in the building materials field. The hardboard manufacturing venture, for instance, has grown to be a big business in itself and has proved an outstanding commercial success. The product, "Timbrock", is a strong high-density hardboard, the natural accompaniment of "Cane-ite", a light low-density board.

As "Cane-ite" is made largely from megass, so "Timbrock" is made from low-grade eucalypt timber, useless for other purposes. Peculiarly suited to the needs and to the resources of the building industry, hardboard has already achieved in Australia a per capita consumption three times that in the United States. It is in itself a lesson in the results of mass production. When hardboard was introduced to the Australian market after the depression plywood was cheap and hardboard comparatively dear. But with the mass production of hardboard in the war years its price fell, in contrast to the rising prices of the vast majority of products, including its old rival, plywood.

Uses of some C.S.R. Building Materials

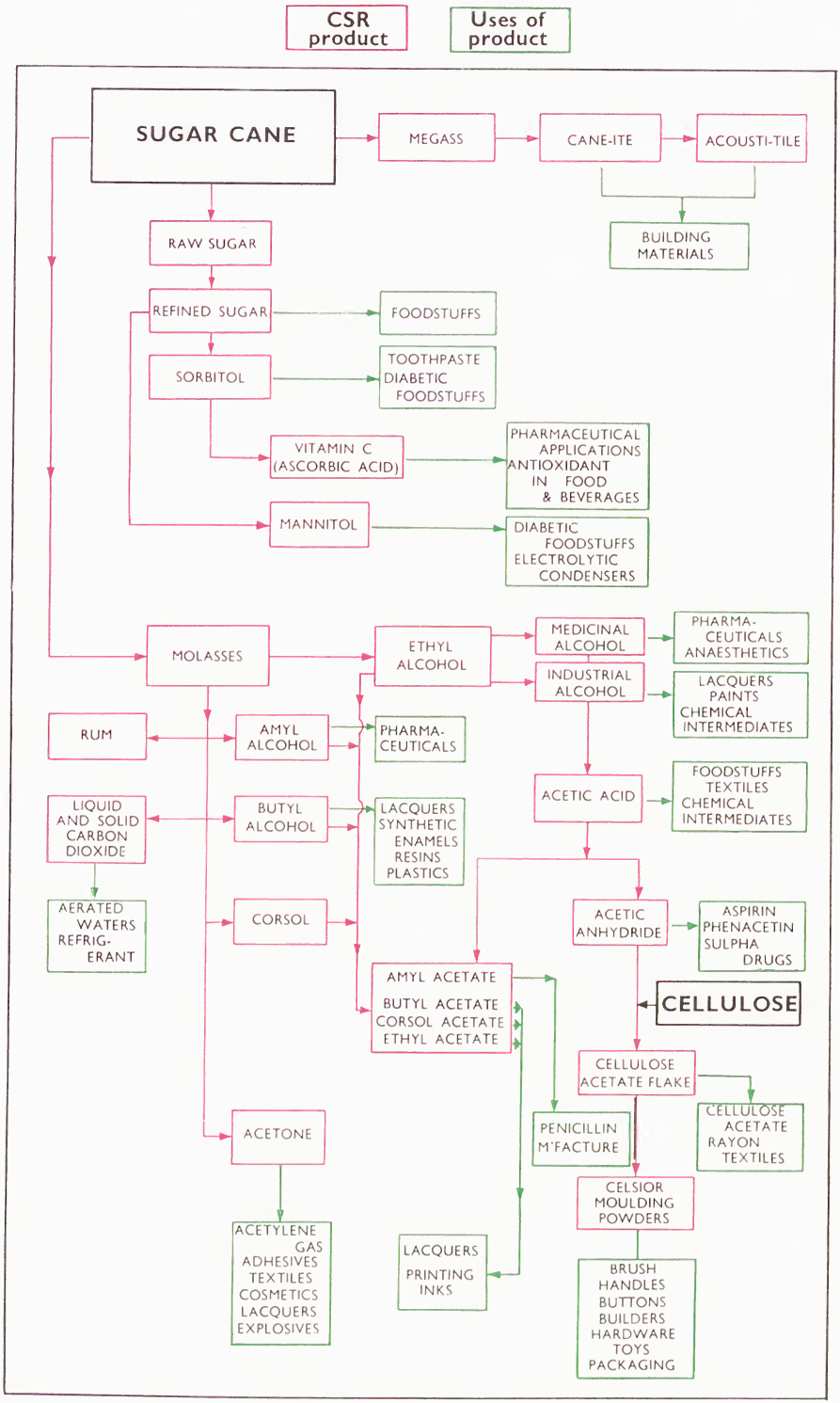


Timbrock upper walls and a *Cane-ite* ceiling in the gymnasium of the Burwood Domestic Science School, Sydney.

A wall of *Gyprock*, painted blue, and a *Cane-ite Acousti-tile* ceiling in a Sydney suburban home.

The foyer of the Australian Mutual Provident Society's building at North Sydney is paved with *Vinylflex* tiles.

C.S.R. PRODUCTS DERIVED FROM SUGAR CANE AND THEIR USES



The story of the manufacture of hardboard by the company goes back to the twenties for its making always appeared to be a natural accompaniment to the manufacture of an insulating board and hardboard was made in the pilot plant at Macknade Mill. For several reasons, however, including the company's term as a distributor of the hardboard made by the Masonite Corporation, manufacture did not proceed until the end of the World War II when the company, now with a wide experience in the making of building boards, was able to design most of the plant itself. Some of the machinery was bought from Sweden but the rest, notably the presses, was designed and built in Australia. Production on a factory scale began in 1947.

With hardboard manufacture it may be said that a further success has been attained in the long struggle to make full use of the native timber resources of Australia. The eucalypt hardwoods, for many years used only as fuel or as a building material in their natural state, were thought by some experts to defy the uses to which softwoods in other countries can be put. Trees elsewhere are the raw material of wrapping paper, cardboard, writing paper, newsprint and building board, all made by separating and reconstituting the natural fibres. Today, following research and development by the paper-making companies and the manufacturers of hardboard, all these are made in Australia with Australian woods, a triumph for Australian research and technology. Less than a generation ago all that could be done with trees in Australia was to saw them up or burn them. Today an enormous range of manufactured products stems from the forest.

Such is the story of the building materials division of the company today. All this has come about in a comparatively short time. It is not to be expected that development will stop at this stage, although about £4 million has already been invested in the division. New vistas continually open.

* * *

A company which produces a perishable product in outlying areas is deeply concerned with the problems of transport. If facilities are not already provided by other organizations it must take steps to move its raw materials and its intermediate and finished products. It must also supply its outposts with all those things necessary to establish and maintain them. The extent of direct operations of C.S.R., covering eastern Australia, New Zealand and Fiji, has made shipping a necessary and important part of its activity.

The story of the company's ships goes back to 1873 when the little collier *Keera*, of 158 tons, was bought for £6,500 and employed between

Sydney and the company's mills on the north coast of New South Wales. She was followed in due course by other small vessels, *Fiona* (lost near the Seal Rocks in 1882), *Terranova*, a paddle steamer (afterwards used as a cable-laying vessel in New Zealand), and *Fiona II.* With *Fiona III*, built at Middlesbrough in 1908, a new and significant stage was begun for, compared with her predecessors, she was a large vessel of 4,471 tons gross register with a deadweight capacity of 7,300 tons. Especially adapted to the company's work, she was fitted with tanks to carry about 1,400 tons of molasses.

Though, initially, the company bought ships to serve its mills without recourse to other companies' vessels—and the serving of the Queensland and Fiji mills remains a most important part of their work—the growing importance of molasses as a by-product exercised a large influence upon the design of later ships. In 1916 *Rona* was laid down—6,205 tons gross with a deadweight capacity of 9,300 tons; her molasses-carrying capacity is 5,600 tons. In 1933, after disposing of *Fiona III*, the company built *Fiona IV* (3,484 tons); in 1938 *Tambua* was added to the fleet and for a time a fourth vessel, *Moa Moa*, was in use. In addition to a large number of lighters, small tugs and launches engaged in hauling the sugar cane from the farms to the mills in New South Wales and Fiji and in the transhipment of sugar to oceangoing vessels in Fiji waters, the company also operated two small vessels, *Marama* and *Rani*, in the Fiji inter-island trade.

Tonnages of molasses carried by the company's vessels increased from 31,240 in 1945 to 71,021 in 1954. Molasses has become the basis of one of the company's most significant new ventures. It has long been one of the important raw materials used in the production of alcohol, both industrial alcohol and potable spirit (rum). Overseas mills began fermentation of molasses for the production of spirit about three hundred years ago, thus putting a previously discarded by-product of the sugar industry to profitable use. In this way the great industries of Jamaica and the general Caribbean area became established.

The founders of C.S.R. naturally did not neglect the possibilities of molasses and in 1873 set up a distillery at Harwood Mill on the Clarence River in New South Wales. This plant, producing both industrial spirit and rum, operated until 1896 when it was closed down. Several years previously the company had started another distillery at Nausori in Fiji. In 1901, however, when the possibility arose that under Federation spirit produced in Fiji would be excluded from Australia, the Nausori distillery was closed, and arrangements were made for the erection of a large plant in Sydney; thus began the

Pyrmont distillery, now the largest in Australia. In 1940 another distillery was set up at Yarraville, Melbourne, to meet the needs of the southern market.

These plants are part of the logical integration of the sugar industry. They use molasses as their raw material and convert it to alcohol by fermentation with yeast. They are established alongside the company's refineries because, first, it is economic to obtain the steam and electric power required in distilling and processing from the plant already installed for refinery use; secondly, they are able to share the deep water berths established for the refineries; and, thirdly, these locations are convenient to the market. Establishment of the Yarraville distillery at the beginning of the war was particularly opportune, for absolute alcohol (spirit from which all water has been eliminated) is a very useful additive to petrol. The acute shortage of motor spirit from 1940 onwards brought a request from the Commonwealth Government for the maximum output of absolute alcohol and both distilleries operated seven days a week, day and night, from December 1940 to October 1943. So necessary was this extra fuel that raw sugar was used to supplement molasses as a raw material.

Alcohol, then, for a number of years was an end-product so far as C.S.R. was concerned. But alcohol is, itself, one of the bases of the organic chemicals industry. In one of the major decisions of its history the company decided to enlarge the horizons still further by becoming a large-scale manufacturer of organic chemicals.

Today the company is "in" chemicals to the extent of a 60 per cent holding in the £6,000,000 C.S.R. Chemicals Proprietary Limited (the remaining 40 per cent being held by the Distillers Company Limited of Great Britain). This offshoot—the word seems rather an understatement for a concern of such magnitude—dates its formal existence only from 1952, but C.S.R. has always been "in" chemicals. Sugar is a chemical and the story of the company's long-term emphasis on chemical control in mills and refineries has been told already. The fermentation of molasses and the distillation of alcohol alike are industrial chemistry. Chemicals were a logical avenue of expansion.

In the late twenties and thirties a policy of developing the use of both megass and industrial alcohol had been decided upon. A start on the megass side was made with "Cane-ite" just before the war, and an initial entry into chemicals was made in 1939 by joining with the Distillers Company of Great Britain and the Sydney chemical firm of Robert Corbett Proprietary Limited to expand an existing factory at Lane Cove, Sydney.

Both C.S.R. and the Distillers Company had interests in the

industrial alcohol field. C.S.R. had met virtually the whole of Australia's industrial alcohol requirements for many years and the Distillers Company had an interest in Queensland where, with a number of sugar milling companies, it had formed Australian National Power Alcohol Company Proprietary Limited and established a distillery at Sarina in the Mackay district. This distillery has been operating since about 1927, producing mainly power alcohol for use as motor fuel.

Though some expansion in building materials took place during the war, further advances in chemicals had to wait. The research department of C.S.R. was fully engaged on wartime problems referred to it by the Federal Government and neither time nor trained staff was available for the company's own affairs. Nevertheless, much valuable work was done at Lane Cove, notably in the production for munitions of acetone direct from alcohol; the acetone plant, which had been constructed from design and "know-how" supplied by the Distillers Company, was operated by C.S.R. as agents for the separate company formed for the purpose. The plant was subsequently bought by Robert Corbett, a company which was itself eventually absorbed by the later-formed C.S.R. Chemicals.

At the time when C.S.R. and the Distillers Company acquired their interest in Robert Corbett that company was engaged in the manufacture of acetic acid (from imported calcium acetate), ethyl acetate and metallic soaps. The plant was extended for the production of acetone and butanol from molasses, and acetic acid directly from alcohol.

Many things can be done with alcohol. With oxygen from the air it can be converted into acetic acid and acetic acid is one of the most important bases of the organic chemicals industry. With acetic acid as a starting point the changes can be rung through a whole range of modern synthetics—from plastic steering wheels to chemicals used in the preparation of penicillin. The world we live in today is becoming more and more dependent upon chemicals in peace as in war. By the degree of its use of chemicals we may roughly gauge the stage of economic progress of a community. Australia is becoming big enough, rich enough and technologically sufficiently equipped to develop in some directions, at least, the organic chemicals industry and to consume the products which it makes.

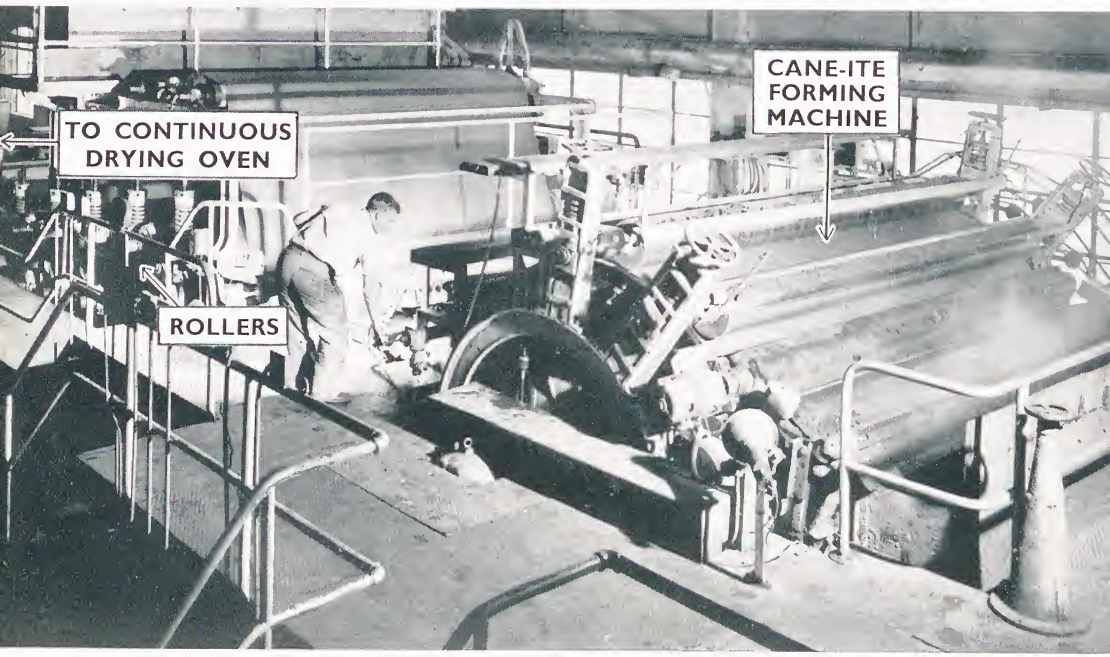
It may be explained here that few, if any, of the bulk products of this industry find their way direct to the general public, hence the comparative unfamiliarity of their names. These products of a series of manufacturing operations by their makers are themselves the raw

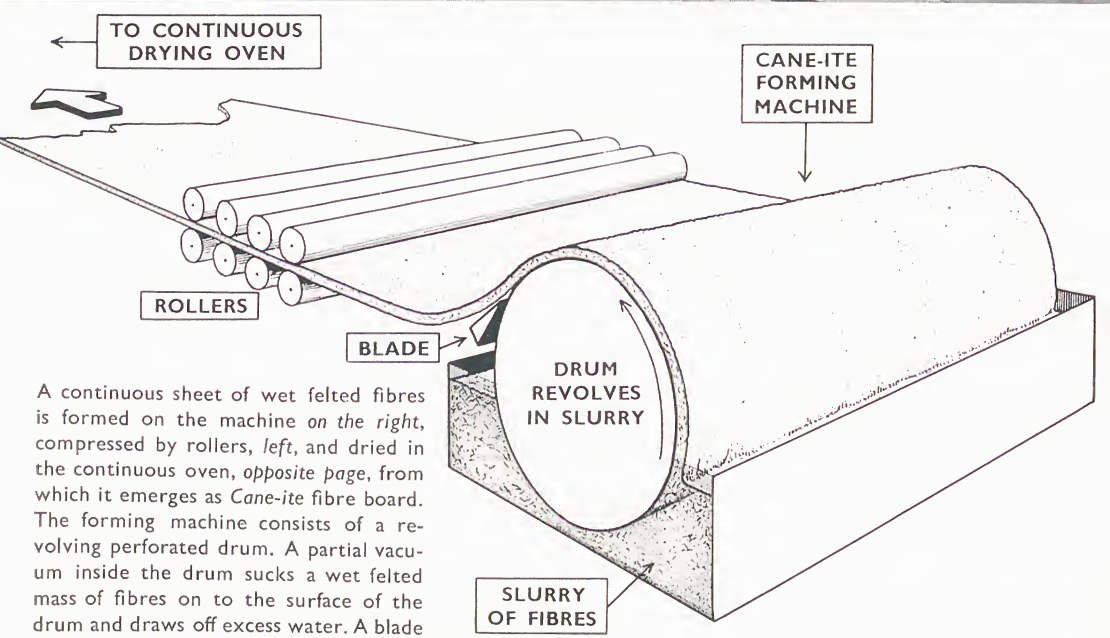
Showroom of building materials sales office in Sydney.

Cane-ite and *Timbrock* factory at Pyrmont, Sydney. Part of sugar refinery on the left.

Cane-ite Manufacture

At right: Baled cane fibre (megass or bagasse) used for making *Cane-ite*. Cane fibre and wood fibre are softened by treatment with steam and chemicals and mixed with water to form a slurry, from which a continuous mat of felted fibres is drawn off by a forming machine, *illustrated below*.





A continuous sheet of wet felted fibres is formed on the machine *on the right*, compressed by rollers, *left*, and dried in the continuous oven, *opposite page*, from which it emerges as *Cane-ite* fibre board. The forming machine consists of a revolving perforated drum. A partial vacuum inside the drum sucks a wet felted mass of fibres on to the surface of the drum and draws off excess water. A blade skins the wet mat off the drum, and heavy rollers

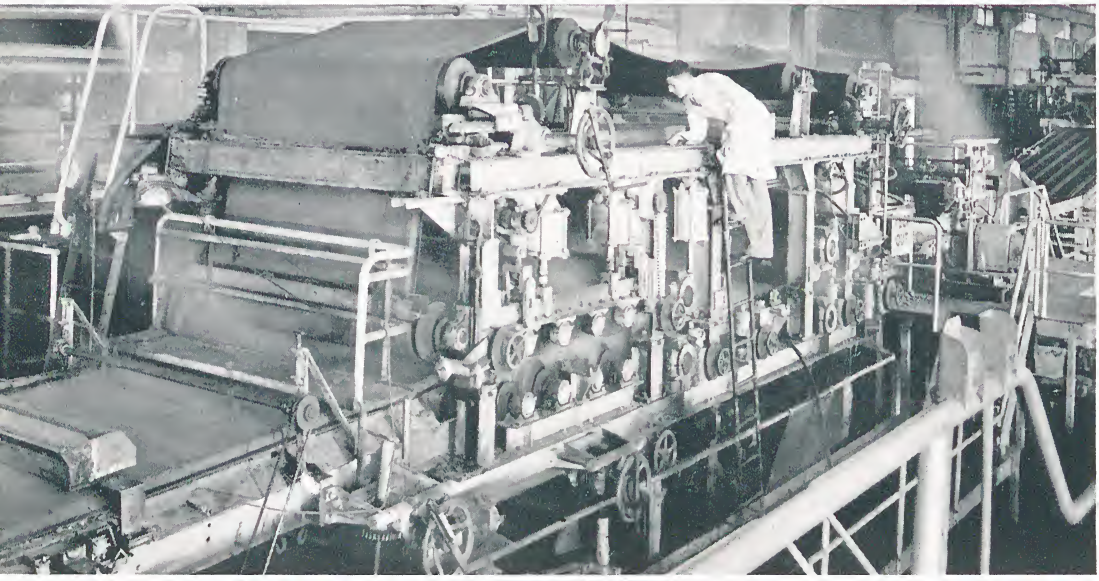
The wet sheets are continuously fed into an 8-deck drying oven, 280 feet long.

As the sheets emerge from the drier they are cut to various sizes. The "spider-leg" tubes suck away dust made by the saws.

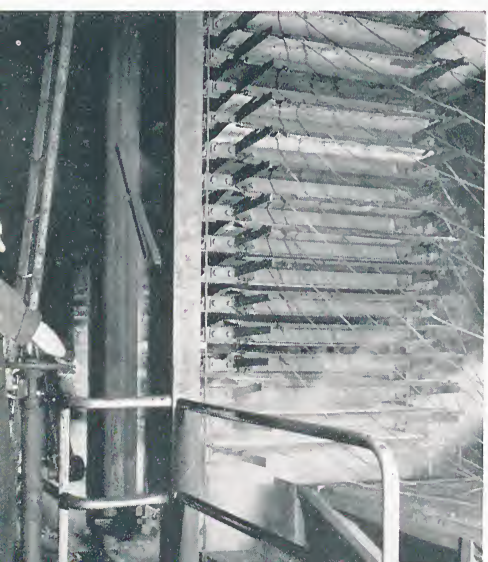
Timbrock Manufacture

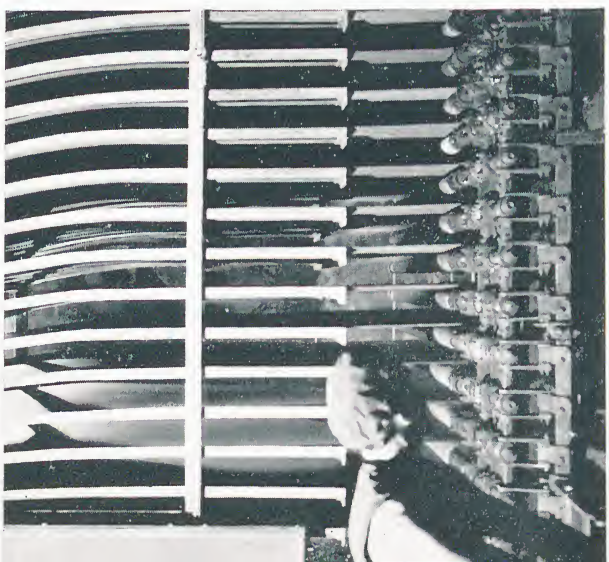
Australia's hardwoods are used as the raw material of *Timbrock*. At the factory they are chipped into small pieces and ground to fibres.

Wood-fibre is mixed with water and chemicals and formed into a continuous strip of wet pulp mat which is then squeezed between rollers.



Sheets of wet pulp are placed in a press between metal plates, heated with steam and subjected to pressure. They come out of the press as finished *Timbrock*. *At left below:* The press. *At right: Timbrock* emerging from press.



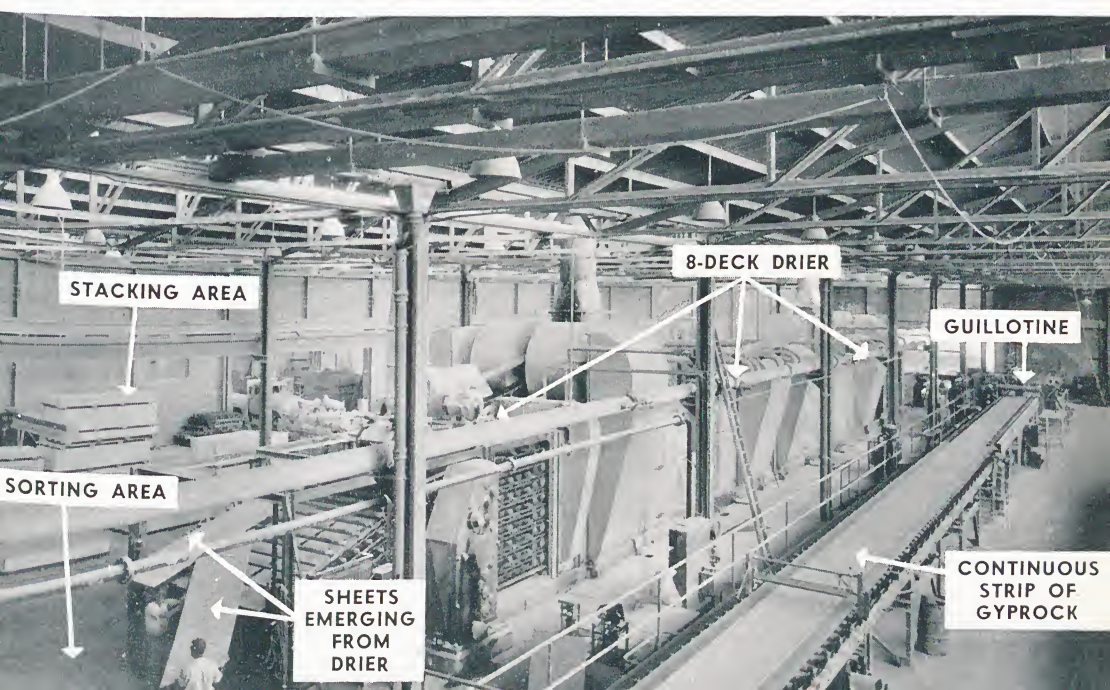


Gyprock Manufacture

Raw gypsum comes from open-cut mines in N.S.W. and Victoria. It is ground and converted to plaster by calcining.

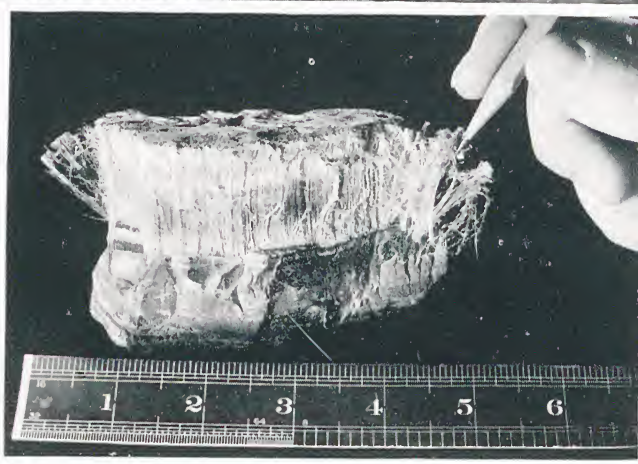
A foamed mixture of plaster and water is fed evenly between two sheets of tough water-resistant paper.

Gyprock is made in a continuous strip, cut into lengths and then dried. The finished product is light but strong, with a surface which can be painted or wall-papered.



Asbestos Mining

The mine buildings of Australian Blue Asbestos Ltd. at Wittenoom Gorge, Western Australia. The mine produces high-grade blue asbestos.



Blue asbestos is a long-fibred mineral. This sample of asbestos ore from Wittenoom shows the length of the fibres.

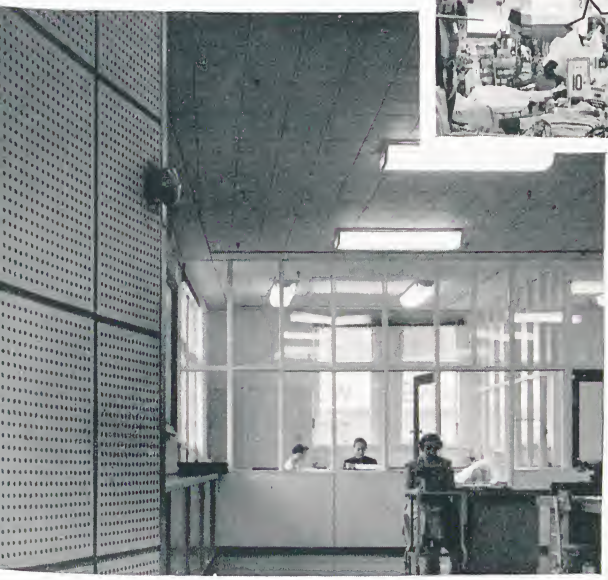
A factory building constructed from C.S.R. *Fibrock* corrugated asbestos cement wall and roof sheets. Down pipes, corner strips and curved roof ridges are also made of asbestos cement.

C.S.R. Building Products in use

Left: C.S.R. floor tiles in a mercery store.

Below: A modern plaster ceiling

Below: *Acousti-tiles* in an office.

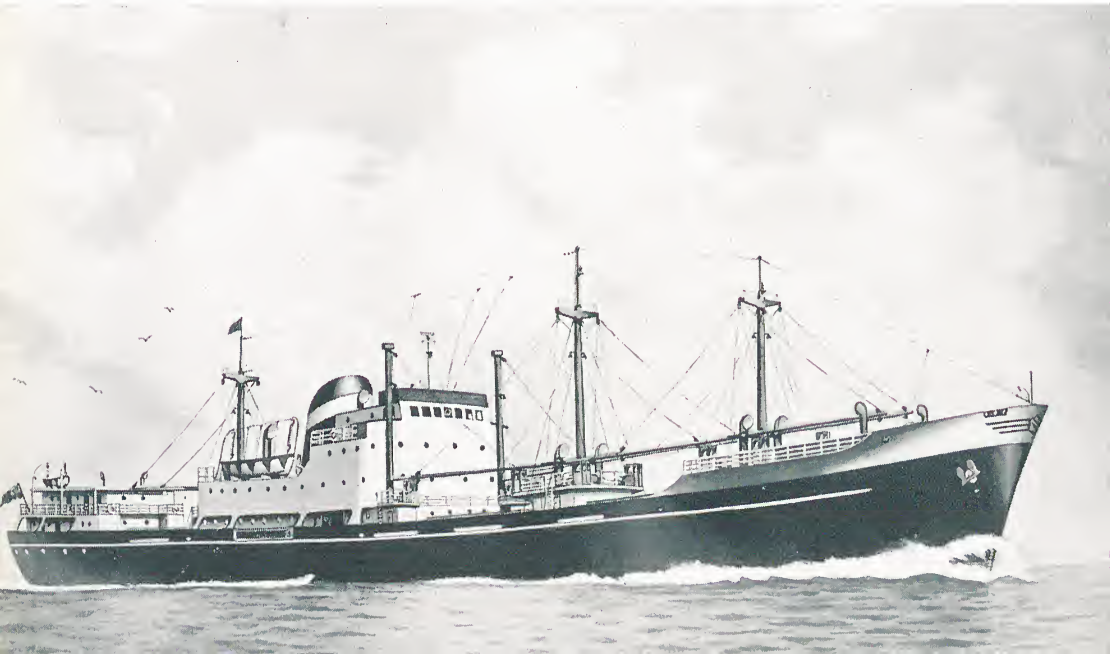


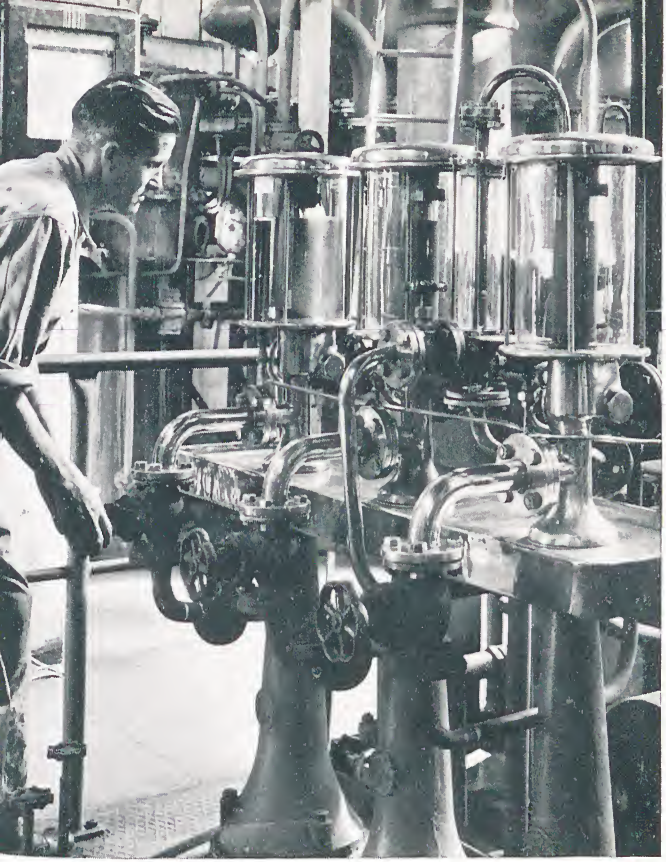
Below: C.S.R. branch office, Adelaide, with *Gyprock* walls, C.S.R. floor tiles, *Cane-ite Acousti-tiles* on ceiling, and a *Timbrock* counter.

Shipping

S.S. *Fiona*, one of the company's three ships. C.S.R. owns also the S.S. *Rona* and the S.S. *Tambua*. These ships carry general cargo, molasses and sugar between Australia, Fiji and New Zealand.

The keel of this new C.S.R. ship has been laid for completion in 1957. *From a watercolour impression by Mr David Hogan.*



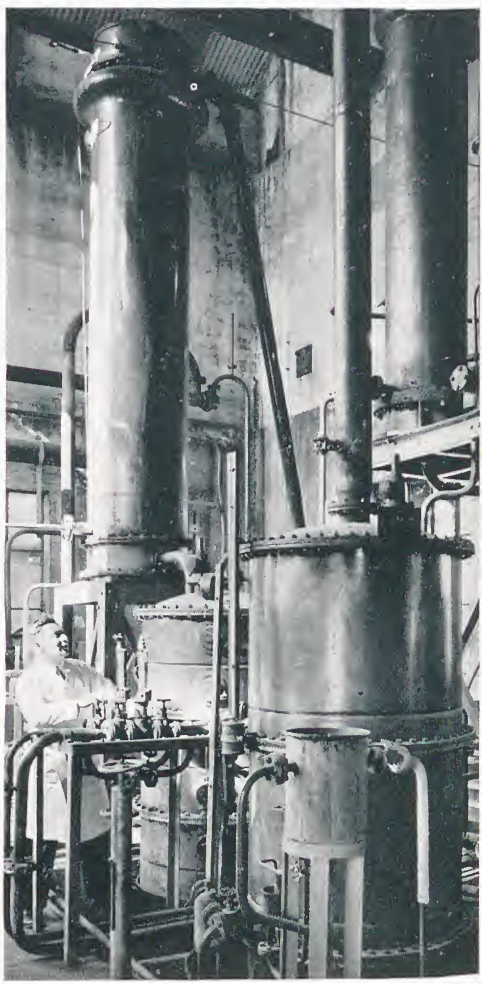


Distilling

An operator checks the spirit gauges in the Pyrmont distillery. At the company's distilleries in Sydney and Melbourne, molasses is converted to ethyl alcohol, white spirit, absolute alcohol, methylated spirit and fusel oil.

Large wooden spirit storage vessels at Pyrmont distillery. The barrels in the foreground contain rum.

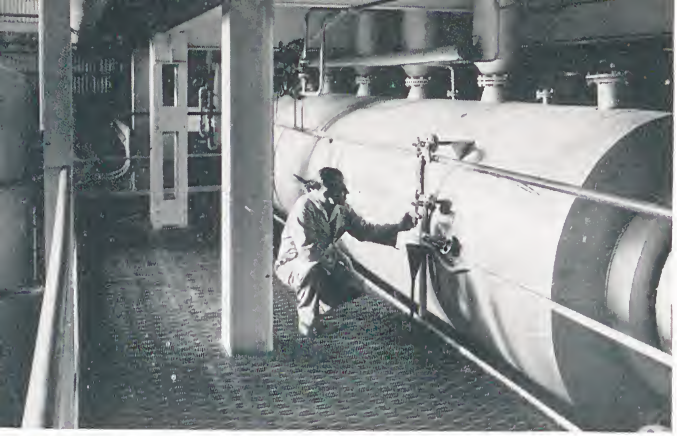
C.S.R. Chemicals' factory at Lane Cove, Sydney. Boiler station, fermentation acetone butanol plant, stores and workshops on left. Acetic acid plant, synthetic acetone plant, esters plant and main office at top right. Cooling water reservoir in foreground.



Above: Condensers and tops of twenty-feet high still columns, in which acetone and butanol are distilled from fermented molasses.

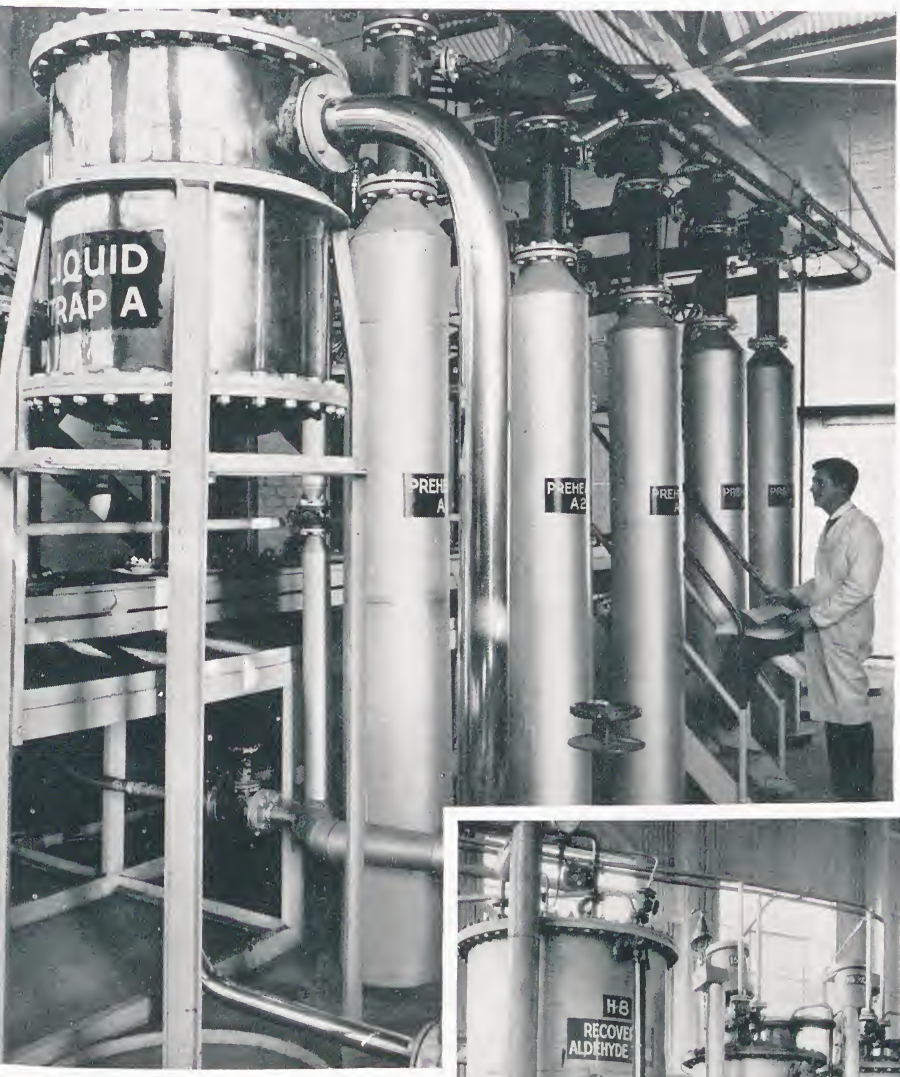
Acetone and Butanol Manufacture

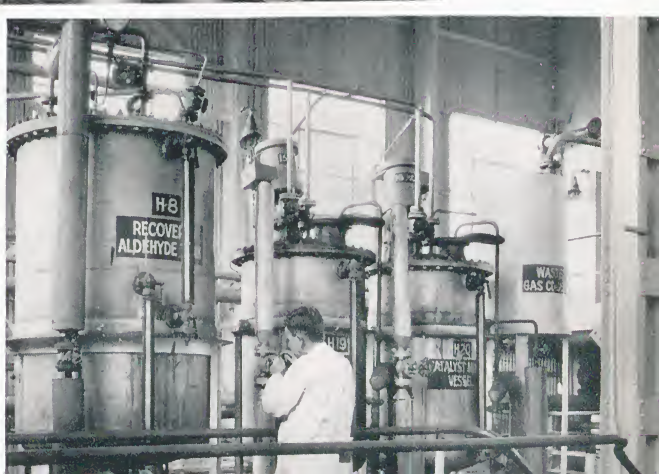
Below: Pressure vessels in which molasses is fermented.



Manufacture of Acetic Acid

Ethyl alcohol and air are the raw materials from which acetic acid is made. Alcohol is vaporized and mixed with air in this vessel.



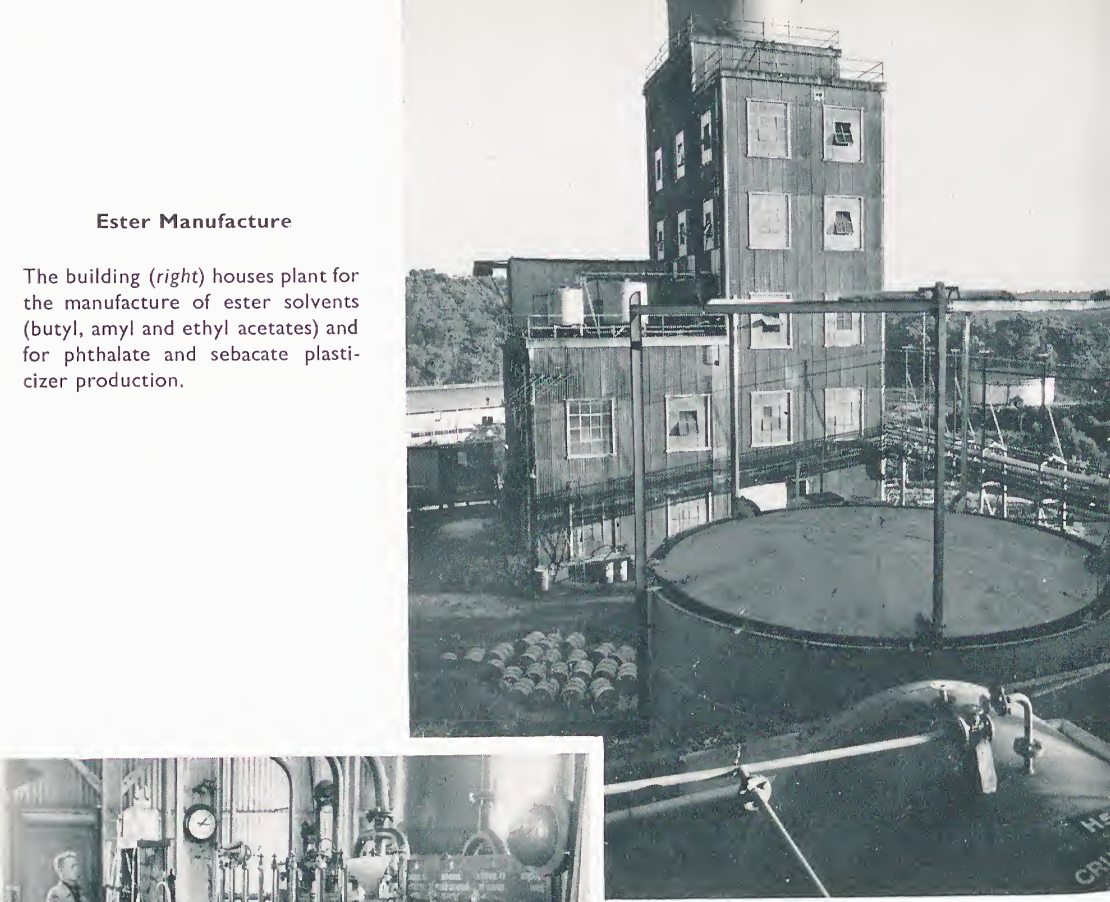


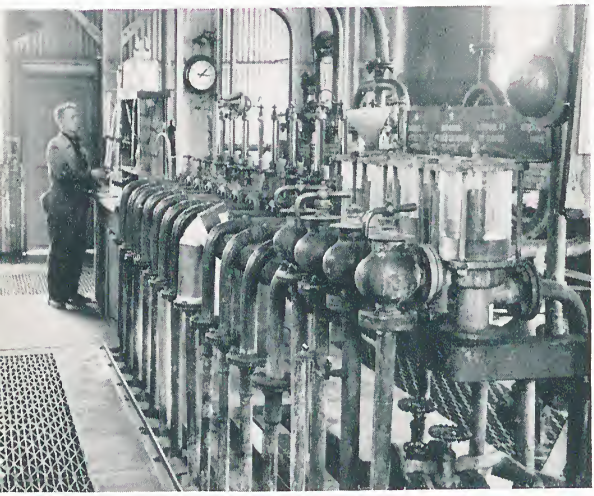
Above: Alcohol vapour is preheated and oxidized to acetaldehyde in furnaces.

Right: Acetaldehyde is reacted with oxygen to form acetic acid.

Ester Manufacture

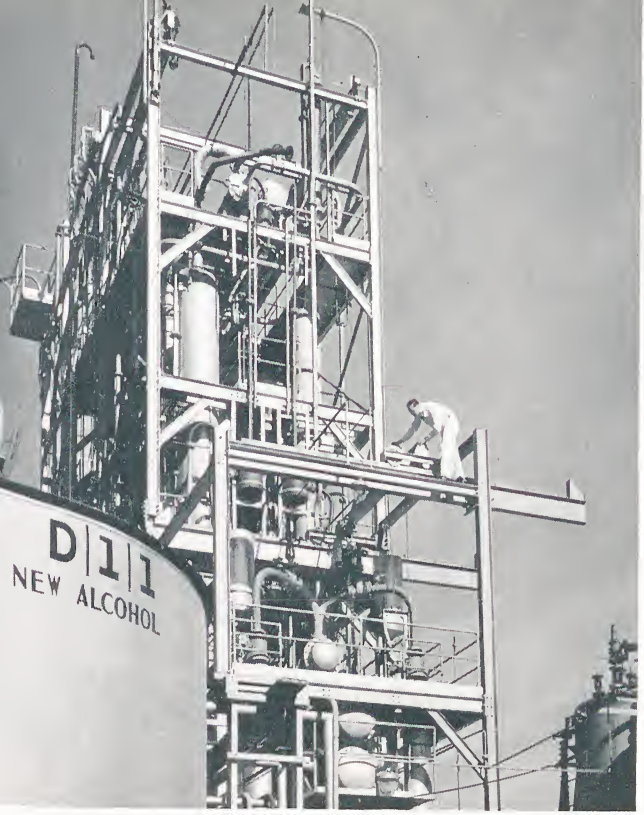
The building (*right*) houses plant for the manufacture of ester solvents (butyl, amyl and ethyl acetates) and for phthalate and sebacate plasticizer production.





Left: Control panel and flow gauges, continuous esterification plant.

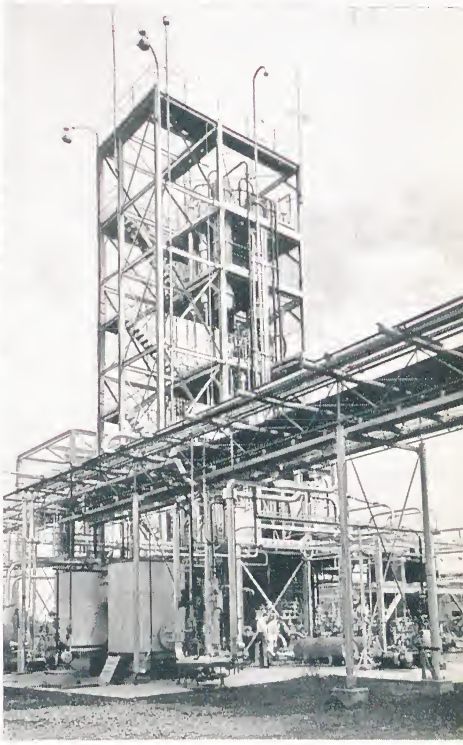
Right: A stainless steel road tanker being examined for internal cleanliness at the loading point, Lane Cove.



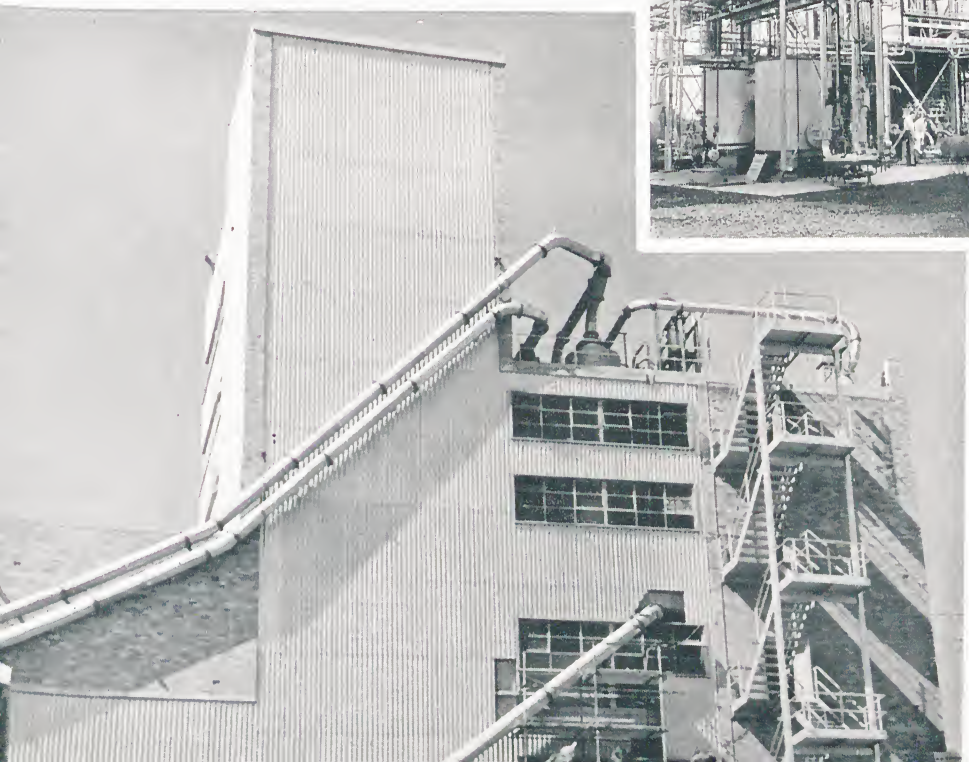
Cellulose Acetate Manufacture

Left: The first step in the manufacture of cellulose acetate at Rhodes, Sydney. Ethyl alcohol, made from molasses, is converted to acetic acid.

Below: Acetic acid is converted to acetic anhydride by a high-temperature catalytic cracking process.

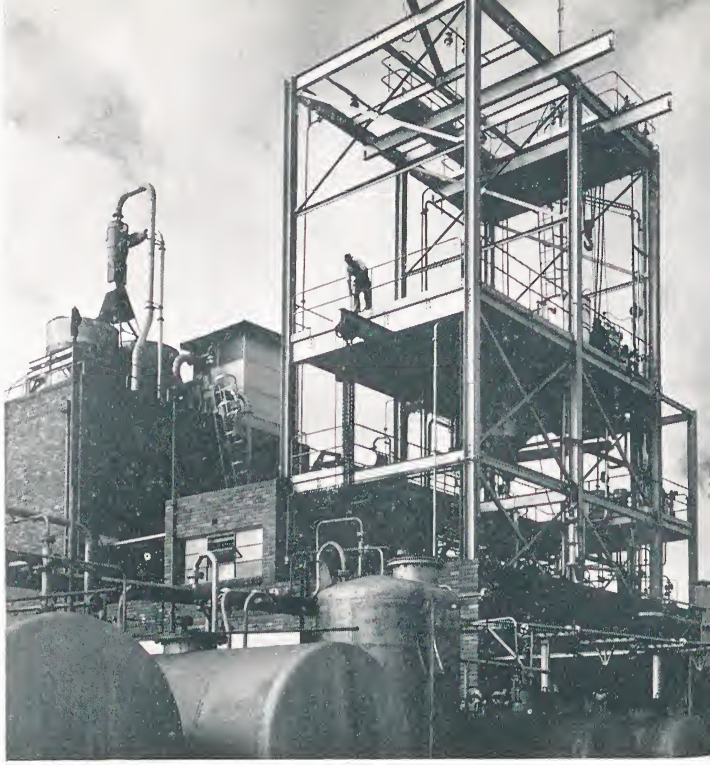


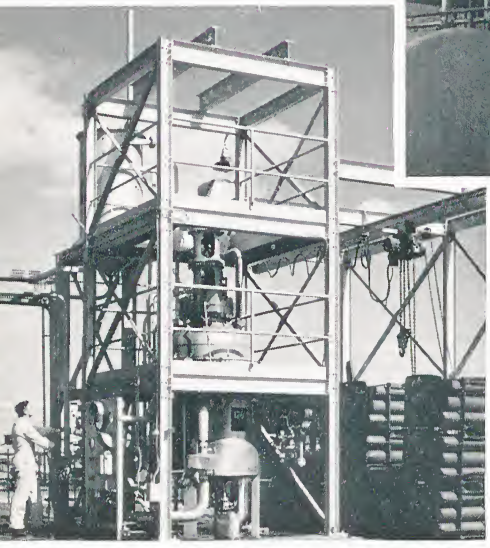
Below: Cellulose and acetic anhydride are combined in this building to form cellulose acetate.



Manufacture of Plastics and Fine Chemicals

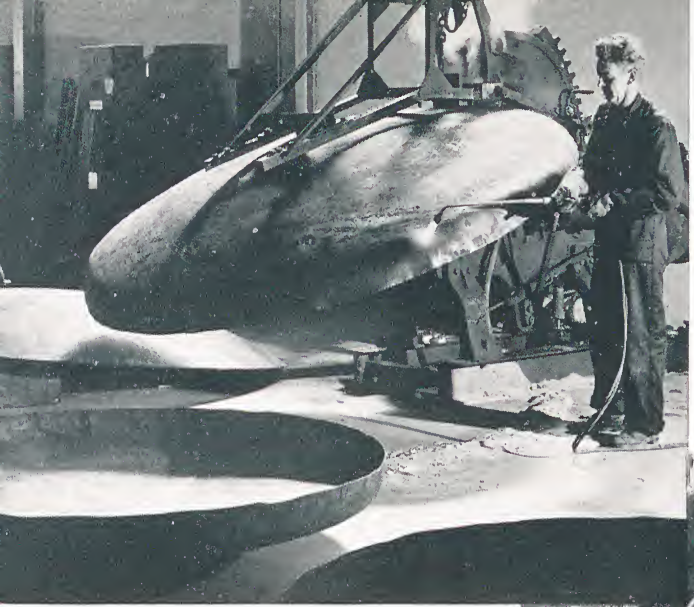
Right: The *Starex* polystyrene plastics moulding powder plant.





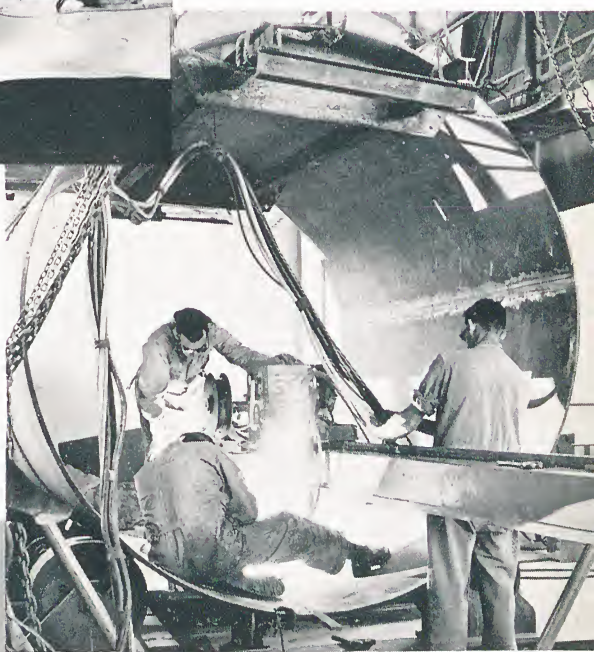
Various fine chemicals are made at Rhodes. The apparatus (*left*) hydrogenates sugars to produce sorbitol and mannitol. Vitamin C is then made from sorbitol.

Celsior plastics moulding powder (*right*) is made at Rhodes from cellulose acetate, plasticizers and colours. It is used by moulders to make many articles of everyday use.

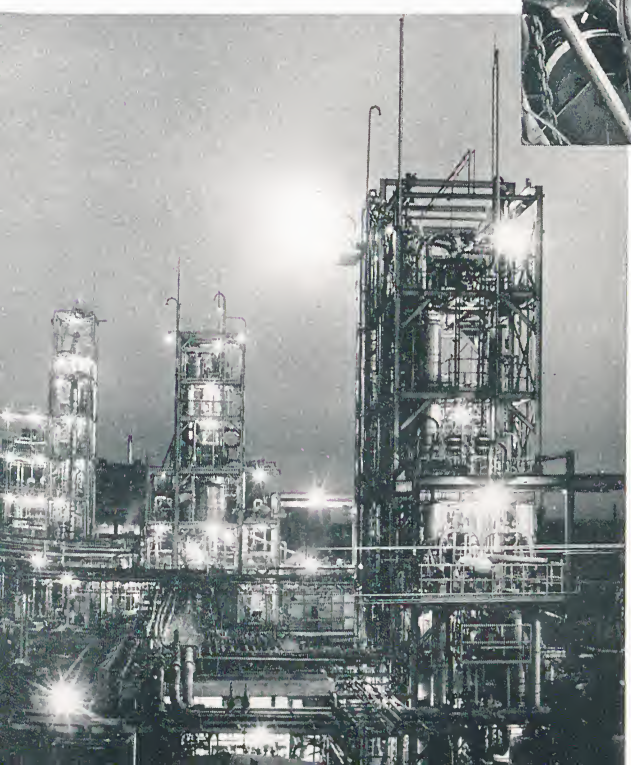


Plant Fabrication

Most of the fabrication work for C.S.R. Chemicals factories at Rhodes, Sydney, was carried out by the C.S.R. Company. Here the dished ends of vessels are being shaped.



Fabrication of special alloys used in the Rhodes plant posed additional problems for C.S.R. engineers. Argon arc welding was one of the many techniques employed.



C.S.R. Chemicals' factories at Rhodes.

Chemicals and plastics moulding powders manufactured by C.S.R. Chemicals are used in making many products. Some of the smaller ones are illustrated above. A variety of industries obtain raw materials from C.S.R. Chemicals—textile, automotive, foodstuff, paint and lacquer, plastics moulding, wine and brewing, cosmetic, pharmaceutical, tobacco, refrigeration, radio, hardware and tools, electrical, printing ink and others.

materials of other industries and may pass through several processing organizations before they find their final marketable form, emerging as constituents of familiar household goods. Take the case of butanol. As a volatile inflammable liquid it is sold by the makers, C.S.R. Chemicals, whom we may call Manufacturer One, to Manufacturer Two. Manufacturer Two adds urea, a white powder which he has bought from another source, and formaldehyde, a noxious gas in solution, and "cooks up" what is known as a synthetic resin called butylated ureaformaldehyde. This substance Manufacturer Two sells to Manufacturer Three who, using more butanol, converts it into a surface finishing paint for the refrigerators of Manufacturer Four. Obviously butanol, butylated ureaformaldehyde or even the eventual surface finishing, which has to be baked on, are of no use to the individual buyer—each is a stage in an elaborate technological sequence, the complexity of which puts it outside the personal sphere of the ultimate consumer.

The association of C.S.R. and the Distillers Company in Robert Corbett was fruitful. We may see it as a stepping stone to a greater venture which was to result in the formation of C.S.R. Chemicals itself. With the ending of the war the industrial situation began to change—development was once more possible. Fears of motor fuel shortage during the war had led the Commonwealth Government to establish grain distilleries for the production of pure alcohol to supplement the nation's fuel supply, and the construction and operation of these distilleries in various States and all the research involved had been carried out by C.S.R. as a top-priority project requiring the full services of a considerable research and technical team. With the end of the war these men, released from this and other important undertakings, were able to turn their attention to the investigation of the manufacture of new chemicals starting from ethyl alcohol as a base.

The research team began work at the C.S.R. laboratories at Pyrmont late in 1944. Various possibilities were examined. Some were dropped in the early stages—costs were too high or markets were too restricted. Other projects, such as the manufacture of ethyl cellulose, an attractive and tough plastic, were taken through to pilot-scale work before a decision not to proceed further was reached. One project still showing promise that emerged from this investigation was the manufacture of cellulose acetate, a constituent of many kinds of moulding powders used in the plastic industry and of rayon yarn and fabric. The company decided to explore thoroughly the industrial manufacture of this product and its related chemicals.

The laboratory stage of research was then supplemented by the building of pilot plants for the making of acetic acid, acetic anhydride, cellulose acetate and cellulose acetate moulding powder. Much progress was made in this way but it became obvious that all the information needed could not be obtained by unassisted effort in Australia. It would be necessary to see overseas plants in operation. Personal investigations, therefore, were made by officers of the company in Canada and the United States, in the United Kingdom and in Germany. The German visit was a difficult undertaking as in the immediate postwar period only persons on official duty were allowed entry. Two of the company's officers solved the problem—they entered Germany as honorary colonels attached to the British Army's T-force, part of the task of which was the study of German industry. They were thus able to make careful examination of the I. G. Farben plants, where much that had been learned in the C.S.R. laboratories was confirmed and valuable additional technical data were gathered.

After further investigation a contract was made with the Hercules Powder Company of the United States for the purchase of working knowledge relating to its improvements on a German process for the manufacture of cellulose acetate and it was then decided to build a factory for making this material. In 1943 the company had bought about eighteen acres of land at Rhodes, Sydney, as a provision for possible expansion, recognizing that suitable factory areas close to Sydney were becoming increasingly valuable and very difficult to obtain. It was on this site that it was decided to start the new undertaking and in the preparation of the site a further twelve acres were reclaimed from the adjacent Homebush Bay.

As constructional work proceeded on the Rhodes site—more than 90 per cent of it by local engineering firms—still further research was carried on, with additional journeys to overseas countries, including Japan, to study methods of manufacture. During all this time the project was being developed and financed directly by the company itself through what was known as the C.S.R. Industrial Chemicals Division. In 1950, however, discussions with the Distillers Company, already an associate in Robert Corbett, led to a further pooling of interests. A new company, C.S.R. Chemicals, was set up to conduct the venture, with C.S.R. holding 60 per cent of the shares and the Distillers Company 40 per cent. It was this company, C.S.R. Chemicals, which subsequently took over the shares in Robert Corbett.

In the Distillers Company C.S.R. has a great and powerful ally in the field of chemical manufacture. Possibly this large British company (its assets total £118,000,000) is best known to the public for the many

brands of excellent Scotch whisky which it makes, and it may come as a surprise to some, therefore, to find that it ranks second only to Imperial Chemical Industries in the chemical industry of Great Britain. The link with the Distillers Company brings to C.S.R. Chemicals a wealth of world-wide experience in the making, buying, and selling of chemicals and, what may be even more important, gives access to a great amount of research work.

In the assessment of the market potential for cellulose acetate flake, C.S.R. Chemicals had the benefit of the experience of Courtaulds Ltd., the British textile firm. The great new factory of Courtaulds (Australia) Ltd. was being built at Tomago, near Newcastle, and C.S.R. took up a considerable shareholding in it. This was to be the start of the Australian rayon yarn spinning industry. Two types of rayon are in world supply; acetate rayon and viscose rayon. After much preliminary investigation Courtaulds decided that the economics of manufacture in Australia and the structure of its textile industry favoured acetate rayon as the first step, and the formation of Courtaulds (Australia) Ltd. was planned on that basis. Their production of viscose rayon was limited to viscose tyre cord, a much coarser product than the yarn used for weaving and knitting. The economics of production of cellulose acetate flake looked satisfactory, and its manufacture had the important national advantage of making the Australian rayon textile industry less dependent than hitherto on imported yarn.

On 24 July 1953 the £4,500,000 factory at Rhodes was officially opened by the Governor-General of Australia. To the layman this great plant is interesting as much for what is invisible as for what can be seen. Like all modern chemical plants (and many other plants also) it is very largely controlled automatically by instruments. Machines now make all the calculations and adjustments necessary for the control of complex processes and do it far more skilfully than any human being can, anticipating and countering deviations from normal with a speed and accuracy beyond human reflexes. Also like many other chemical plants, most of the Rhodes plant is out-of-doors—not roofed in or walled in. The various units of stainless steel and aluminium sit out by themselves in the open air. If the layman wants to know what goes on in them he must ask the chemical engineers unless—which is highly unlikely—he can read the processes in the instrument charts and flickering dials. The plant is one of the outstanding examples in Australia of automatic control and operation.

The story of cellulose acetate is a success story—a technical success story. Thousands of plans were drawn, obstacles to the fabrication of

chemical equipment in Australia were tackled and overcome, a first-class series of plants was constructed and, finally, the chemicals produced proved on the evidence of overseas experts to be of quality equal to any in the world. But the period of building at Rhodes coincided with the steepest inflationary period Australia has ever experienced—wages rose 100 per cent from 1949 to mid-1953, and labour and materials were in short supply. The costs of electricity, gas, and coal skyrocketed. All this meant a great increase in capital cost necessary to complete the project and higher operating costs when the plants began production. This rise in the cost of the Australian product unfortunately coincided with a drop in the price of the overseas material. It became necessary, therefore, to ask the Federal Government for assistance on the cellulose acetate project. After a hearing by the Tariff Board the Government decided against granting assistance, but on further representations the matter has been reopened and the verdict is now awaited. This verdict will determine whether the technical success, which after all is really only the prologue of this section of the C.S.R. Chemicals story, will be followed by the financial success which is essential to complete it.

But cellulose acetate is only one of a number of products, all previously imported, now manufactured at the Rhodes and Lane Cove factories. The solvents industry at Lane Cove, which has proved a flourishing business, has been considerably expanded since C.S.R. acquired an interest. A plant for the continuous production of butyl acetate supplies the full requirements of the Australian lacquer industry for that solvent, and the rapidly expanding plastics industry now looks to that factory for its phthalate plasticizers for compounding the resins used in making such things as covering for electric cables, garden hose and raincoats. Furthermore, a plant has recently been erected at Rhodes for making that popular plastics material, polystyrene, which is moulded into so many articles in everyday use.

Apart from its industrial chemicals, C.S.R. Chemicals also produces certain "fine" chemicals such as Vitamin C. Fine chemicals generally comprise the newer, higher-priced chemicals not used in anything like the tonnages of such old stalwarts as acetic acid and the solvents. Their market is not firmly established and consequently they often present some commercial hazard as they may be replaced by some better chemical; or the market price may fall drastically as more manufacturers enter the field. In Australia, where the local market is small, there are especial difficulties. If, however, the raw material is readily and cheaply available—preferably a chemical of agricultural origin—it is possible for Australia to compete in the world fine chemical

markets as she is now doing. Ascorbic acid (Vitamin C) is a chemical which fulfils these requirements, as sugar is its starting point, and today it is being exported in substantial quantities.

Although "vitamin" has become a popular term only in comparatively recent times the fact that certain fruits, notably limes and other citrus fruits, contained an ingredient preventing scurvy (that is, anti-scorbutic or ascorbic) has been known for many years; it was recognized, for instance, by Captain Cook. This substance, Vitamin C, was isolated in the laboratory in the late twenties and synthesized a few years later. In 1937 it was produced in commercial quantities in both America and Europe and it has since become generally known and widely used. There is an interesting background to its production in Australia.

In 1940 the Drug Sub-Committee of the University of Sydney, following reports of scurvy among members of the Australian Imperial Force in the Middle East, decided to attempt the synthesis of ascorbic acid in Australia and succeeded in producing it on the laboratory scale. Meanwhile the facilities of the research department of C.S.R. had been offered to the Commonwealth and the department was given a variety of tasks including the production of ascorbic acid on a commercial scale. With improvised equipment a pilot plant was erected by the end of 1942 and production began at the rate of 80 lbs. a month. By the end of the war the production rate had been increased to more than 400 lbs. a month and altogether more than 8,000 lbs. was produced and sent to the armed forces in the form of fortified food and tablets. Demand did not cease with the war, however, and it was decided to design and erect a new factory at Rhodes. Now, instead of rating in pounds, production is rated in terms of tons per month. The production of ascorbic acid from sugar in a six-stage synthesis on a factory scale is the most complex in a long history of processes which began many years ago with the production of rum at a colonial distillery on the Clarence River.

The hazards mentioned earlier are not technical but economic. Thus another fine chemical, para-amino-salicylic acid—known as P.A.S., made by C.S.R. Chemicals proved commercially unprofitable and its production had to be abandoned. This material is most useful in the treatment of tuberculosis. World production was insignificant and none was available for clinical trials in Australia. The research department of C.S.R. worked out its synthesis and C.S.R. Chemicals began making it. Technically the manufacture was successful and an excellent product was made which was gladly accepted by the T.B. clinics and the medical profession. The basic raw material was not

made in Australia, however, and as supplies of P.A.S. became freely available from overseas at lower prices the local material was priced out of the market.

Other sugar-derived chemicals, such as sorbitol and mannitol, are exported, as well as ascorbic acid. They not only provide new uses for Australian raw materials and new services for the Australian people but they prove that, given the right economic background, the most complex processes can be exploited as successfully in Australia as in countries with a long experience in organic chemicals.

The benefits are both specific to the company and general to the nation. Expansion into the new fields has created many opportunities for staff advancement. The new sections, of necessity, have had to lean heavily on the parent body for key staff and with notable exceptions the managers, accountants, chief chemists and chief engineers of the new factories are people who were trained from an early age in the sugar operations of the company. In recent years there has been a slight reversal of the flow of staff and some senior officers have been brought back into the sugar side; so the varied techniques and skills of sundry industries are finding their way back into the general stream of knowledge in the company.

The new ventures of C.S.R. are economically and strategically important to Australia. An Australian driving past the green fields of cane in the warm, lush Queensland littoral may well take pride in realizing that upon the foundation of this primary product has been raised a whole series of industries, some of them among the most technologically complex in the world. This is the full exploitation of national resources, and if it be the duty and the need of a nation so to exploit its resources then here, it may be claimed, the job is being well done. This is not to imply that all the possible uses of sugar have been found and developed. It is reasonable to assume that in years to come there will be many more. The potentialities of organic chemistry in juggling the atoms of hydrogen, carbon and oxygen to produce a new world of synthetic products are almost limitless.

EDITOR'S NOTE

Since Mr Clive Turnbull completed this chapter in September 1955 several developments have taken place in C.S.R.'s newer activities. Greatly increased market outlets have been secured overseas for blue asbestos from the Wittenoom mine, and governmental approval for the industry has been forthcoming in the form of a small and temporary subsidy from the Western Australian and Commonwealth Governments. In the chemical field, cellulose acetate manufacture has

also been granted temporary assistance in the form of a bounty on local production.

The greatly improved prospects for the Wittenoom blue asbestos project are mainly the result of steadily increasing efficiency and lower costs and, above all, active and persistent efforts to find and enlarge markets. 8,000 tons of blue asbestos were sold overseas in 1955 at about £100 per ton. Sales negotiated in the United States, together with other markets which have been established in Europe, are expected to lead to total export sales of 12,000 tons, worth £1,200,000, in 1957 with exports rising further in subsequent years. The industry's value as an earner of overseas funds has been recognized by the Commonwealth Government which has granted a subsidy of £5 per ton up to 6,000 tons for the year ending September 1956. This matches a similar subsidy granted by the Western Australian Government. While the assistance of the two governments is temporary it is especially valuable as a definite indication of both Federal and State approval for the venture.

The importance of local production of cellulose acetate rayon yarn has also been recognized by the Commonwealth Government which, acting on the recommendations of the Tariff Board, has decided to pay a bounty of 10d per lb. on cellulose acetate flake sold for the purpose of manufacture into cellulose acetate rayon yarn. This assistance is limited to a three-year period and to a total of £142,000 in any one year and was recommended by the Tariff Board as preferable to the imposition of a tariff on the imported product. The Tariff Board, in recommending this assistance to the industry, took into consideration C.S.R. Chemicals' "strenuous and rewarding efforts to reduce the cost of this product" and noted that "on the basis of production by C.S.R. Chemicals Pty Ltd of 3,400,000 lb. of rayon grade cellulose acetate flake per annum, the saving to Australia of overseas funds would be of the order of £340,000 per annum". The future of cellulose acetate manufacture is still dependent on efficient production and also on the possibility of reducing costs still further through an increased market for fabrics made from acetate rayon yarn.

CHAPTER 12

Men and Organization

R. W. HARMAN

The growth of organizations with over 10,000 men employed in diverse activities spread over wide distances is a fairly new thing in man's affairs. Until little more than a hundred years ago the responsibility for control of such large numbers of men was restricted almost exclusively to governments and their armed forces. In this chapter the General Manager tells how C.S.R. pioneered and developed ways of organizing the efforts of men and women on such a scale in the South Pacific. He describes the way in which men are selected and trained to staff the organization, and the qualities which, in his experience, make for leadership in industry. He also discusses the characteristics whose application in business contributes to profitability and general economic progress.

Dr R. W. Harman was born in Nelson, New Zealand, brought up on a dairy farm in the Hamilton district, and educated in Hamilton, Auckland and London. He joined the company in 1924 as manager of the research department and served in a number of responsible positions before becoming General Manager in 1951.

March 1956

This chapter gives a straightforward and sometimes detailed account of our organization and how we man it, and I believe that the facts thus presented will speak for themselves. It is not my intention to give a technical account of the theory or theories of company structure and management. The theories and principles are reflected in the practice, as far as we have been able to evaluate them and put them into operation in our particular type of business and in the conditions applying in the South Pacific.

My task, therefore, is to describe the organization of C.S.R. and to give a picture of the men who fill the various positions in it and who give the company vitality and, I have no doubt, a positive personality. Companies vary in this respect and they change as time passes and as circumstances and environment alter.

The character of a company develops from many things—the type of business in which it engages, the localities and communities where it operates, the structure of its organization, the policies and methods used to pursue its objectives and, of course, the nature of those objectives. It is affected, very importantly, by its leadership and therefore by the kind of men chosen by shareholders for the board of directors, by the kind of men engaged, under the policies of the board, for the staff, and especially by those promoted to senior management.

The Foundations of Employee Policy

At the outset, I quote some remarks made by Mr E. W. Knox at the general meeting of C.S.R. shareholders in its jubilee year in 1905 which indicate something of the character of the company at that time and its attitude to the employees:

> For once—in fifty years—I propose to break the salutary silence observed by the Manager at these meetings, and to say a few words about those who, with me, serve the company, and whom you have just thanked for the work they have done.
>
> To the development of which the Chairman has spoken, they have contributed; but I am sure that they recognize the fact that the work they have done has to a large extent been influenced by the liberality shown by the Board in fixing the conditions of employment.
>
> Now, the first of these is that each and all of us shall have plenty of work, and this rule has always been observed so far as to keep our minds and muscles healthy by a sufficiency of exercise.
>
> Then we are told that we must be always a little better off than men in other services, and in consequence the wage earners

have more regular work, the salaried men more allowances, and all, I believe, somewhat more pay.

Thirdly, the Board have given most liberal support to the Benefit Society for the wage earners and the Provident Fund for all grades of the service, and thus our employees are helped in providing against sickness and old age.

Finally, it is the constant aim to avoid the centralization which tends to relieve men away from the Head Office of the responsibility which should attach to them, and this is one reason why a business, stretching from Fiji to Fremantle, can be worked with some measure of success.

With such terms of employment you have the right to expect willing and hearty service, and this you have got. To the staff generally the progress of the company brings pleasure and pride, and there must be many besides myself who would gladly live over again the years of interest they have spent over your affairs.

As to the future, well, I have seen too many changes to wish to pose as a prophet, but I will venture to say that if you keep as hitherto a strong and contented staff, and this staff be led by men who regard successes as the forerunners of trouble, and can always be trusted to feel in times of danger the elation of spirit which difficulties bring to those who mean to overcome them, you need not fear what man can do unto you.

Although there have been many changes in the company in the quarter of a century since E. W. Knox died, most of them are a natural growth from the solid foundations which he laid. The change is least in the type of men who constitute the staff and in the basic characteristics of the company. Conditions of employment remain good. Work remains plentiful; responsibility is still widely spread; and the staff continues to have a sense of purpose and to tackle with zest the difficult and sometimes exciting problems of our time.

Men and Objectives

Sir Edward Knox, chairman of the board since Mr E. W. Knox retired in 1933, has stated in his introduction to this book the broad aims and objectives of the company. Men need objectives, ends towards which to strive, and often they seek them as members of a group. The staff of C.S.R. is such a group, within which a high degree of voluntary consent is given by individual members to the group objectives, however difficult it may be to reduce those objectives to simple definition. Within the company there is considerable agreement on the unwritten

code to be followed in achieving its ends. The knowledge that important economic and social consequences flow from policy decisions and the resultant actions helps to develop a wide sense of responsibility.

The means by which capital provided by the owners can be applied to attain the company's objectives can be thought of in three categories, although in action they are interlocked and interdependent. First, the organizational structure provides the framework; but it is only a framework—static, bare, not human. Secondly, the character of the men on the staff, their education and development, and the values they respect clothe the framework, make it viable and give it human values. Thirdly, leadership and guidance are vital as means of achievement and they involve both planning and execution—determining first what needs to be done and then seeing that it is done. For, while the typical businessman may not be on the same intellectual plane as the professor, he puts the whole power of his will into the realization of his ideas. Knowledge, rather than practical results, is the goal of the professor, as a true scientist, and the fact that he has gained and can pass on knowledge is often satisfaction enough. Achievement, rather than knowledge, remains the test in business.

Not only must we in business have ideas that are sound and plan what we should do, but the plans must be well carried out. One of the important factors of life is this capacity for execution, the ability to direct one's whole energies towards the fulfilment of a particular task. Usually at the head of business affairs are men not only of sufficient intellectual ability to plan, to determine what should be done, but also with sufficient executive ability to follow up and force these plans to realization.

Organizational Structure of the Company

The basic organization is inherited from the period of growth under E. W. Knox, but the company has changed in many ways since his time. It is much bigger, even in its main business of sugar. It is much more diverse, having large activities outside sugar. Along with this growth in manufacturing operations there has been an increase in the number of people employed, and the variety of manufactures has called for greater diversity in technological and commercial skills. The technological section has always been strong, but, in expanding from sugar to distilleries and then to building materials and chemicals, our engineers and chemists have not only increased in numbers but also in their ability to initiate, develop and manufacture the new products. The marketing and the general commercial sections have

also increased and developed in comparable strength, because it is no use making things unless they can be sold, and sold at a profit.

It will have been realized from other chapters in this book that C.S.R. is organized into operating divisions based, for the main part, on the type of product or service. For example, the seven sugar mills in Australia are grouped together in one division and the six refineries in another. The divisions of the company are:

Refineries, Australia and New Zealand;
Raw sugar mills, Australia;
Raw sugar mills, Fiji;
Sugar marketing;
Distilleries;
Ocean vessels;
Building materials;
Industrial chemicals.

The factories and operations of these divisions are spread from the Indian Ocean across the South Pacific and extend to London, but the heads of these divisions are all at headquarters—the company's Head Office at 1 O'Connell Street, Sydney. This is also the seat of management of the company, and here the board of directors meets.

There is a good deal more to the management of a company than merely bringing together in one building the heads of divisions, the general manager and the board. For one thing, the operating divisions have to work to certain common policies and many of their activities have to be co-ordinated. For another, specialist departments have to render service to those in the direct line of control of divisions. Further, shareholders' and general company matters have to be administered and, most important of all, the business has to be considered and ordered as an all-encompassing whole.

Each division is organized in a line of control, which means that control at various levels of management is centred in single individuals and no one has two or three different masters. But so much special knowledge and experience is required today that specialist departments outside the direct line of operations have to be brought into action too. The working-in or integration of these specialist departments, or functional departments as they are sometimes called, is a difficult matter and the method varies among companies, but a smooth, efficient working-in is necessary for success. Further, the services of these functional departments have to be applied not only to particular divisions or activities but to the organization of C.S.R. as a whole.

The main functional or specialist departments are the secretary, central accounting, central engineering, central chemical, research, industrial and staff.

The Tasks of Leadership

To unite in co-ordinated action the work of the divisions and of these functional departments which serve the company as a whole, to know what to do and how to do it and why it has to be done, to see that it is done, to view the business as a whole and ensure that it is successful, to communicate these conceptions to others—in other words, to provide direct leadership to the staff and to administer the company—is the job of the general manager. Obviously, this administrative work in a company such as C.S.R. is beyond the powers of a single individual so to assist the general manager are two assistant general managers and two senior general executives who, with him, form the general management group.

The company's basic structure is illustrated by the chart *Organization of C.S.R. Headquarters* but this gives only a bare outline and I now give a brief description of its working in practice.

At the head of the company is the board of directors. The present board consists of six directors: the chairman, Sir Edward Knox, with four directors of varied background and experience and myself as general manager. None of them, except myself, are employees of the company. As general manager I am both the executive officer of the board of directors and the administrator of the company. The general manager may, or may not, be a director, and he is the only executive officer who regularly attends board meetings.

The general management group considers all matters of importance to the whole organization arising from any part of it. Each of the assistant general managers and senior general executive officers is also responsible for general supervision of several of the divisions and service departments, but the administration of these divisions and departments is left to the respective heads. It is the function of the general management group to see that, wherever practicable and desirable, common policies are pursued in the different parts of the company. This group helps to decide what should be done and keeps watch to see that the plans are being carried into execution. It has further responsibilities, such as to see that the right men are secured for the staff and that they are trained and developed and given changes of experience, with opportunity for promising men to advance; that new ideas and tools of business are explored and, if good, put into use;

that new products and enterprises are considered and that the risks and rewards are evaluated; that proper use is made of the specialist departments that do not belong to individual operating divisions; that matters affecting more than one division are handled in each division to the full advantage of the enterprise as a whole; that difficult matters are brought to the stage of positive decisions and that action flows from these decisions. The general management group must ensure, too, that the organizational structure is such that the work of various parts can be co-ordinated readily; that co-operation is obtained; and that there is not only quality of decision but speed of decision.

Somewhat similar authority and responsibilities apply to the various levels of management, but with some changes of emphasis and restriction of scope. Leadership must continue all the way down. The health of the organization is as dependent upon good leaders, administrators and executives at the lower levels as at the top. Even the most able men at the top are almost helpless unless the junior officers and N.C.O.'s are capable, energetic and of good character.

All the men in the general management group, and indeed most of the executives in the company, have served in the enterprise almost all their working lives. The four senior general officers were, by early training, a chemist, an economist-accountant, an engineer and an agriculturist. They have worked up through the company in different activities. Their offices are adjacent to one another and to mine and a wide range of experience and ability is thus brought to bear without delays upon all our problems.

At the level of the divisions some degree of separateness is necessary. The heads of divisions are concerned primarily with getting results from them and this is assisted by a degree of separateness which helps them to pursue their individual goals. General management's goal is the success of the company as a whole—all the divisions and functions taken together, and close physical proximity and daily personal discussions of members of the general management group facilitate its attainment. It would not be sensible to place all the heads of divisions together as a group, but we do keep them close to each other in Sydney and continually stress the need for close relations between divisions, between divisions and general management, and between divisions and the functional departments.

Qualities for Leadership

There may be confusion about the use or meaning of the terms "leader", "executive", "administrator", "manager", "boss", but all have one thing in common—they refer to men who have to get things

done through other people. The higher the level, the more this is true. It has been said that the qualities which distinguish the successful administrator are his ability to think and act responsibly and with initiative, to work co-operatively with others and to provide others with opportunities to work effectively and with satisfaction within the group.

What is required to make a good administrator is much more than an academic question in business because it is the responsibility of top management to select and develop younger men in this regard, and at the same time to communicate the ideas and methods to others in order to make it a continuing process. There is no set formula, for one has only to look at the successful managers and administrators to see how their particular qualities vary from an ideal list of executive virtues. But certain innate traits and characteristics are necessary, and I am sure that, given these, certain skills, not necessarily inborn, can be developed, if one goes about it in the right way. I like the analysis that puts these developable skills as *technical*, *human* and *conceptual*.

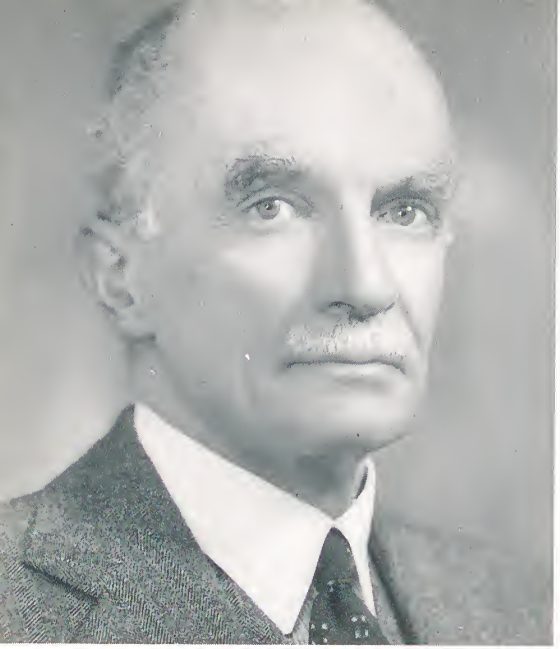
Technical skill is the application of special knowledge of a specific activity, such as engineering or accounting. It is concerned with methods and procedures and is to a large extent related to *things*, *processes* or *physical objects*.

Human skill is mainly concerned with *people*. The man with this attribute is skilful at understanding people, communicating with them and in getting them to work with him and for him. Typically, this kind of skill is needed by a production manager.

Conceptual skill is harder to define. It means seeing the situation as a whole; assigning the weight which should be given to each of the many factors bearing on it; visualizing the inter-relationship of factors inside one business, in a whole industry, or between one industry and another, of politics, economics and technology, of the company's objectives and the interests of shareholders, employees and creditors. It includes the willingness and ability calmly to contemplate and evaluate. It is the unifying, co-ordinating ingredient and embodies consideration of the technical and human aspects.

This separation into three skills is useful for purposes of analysis, but in practice the three are so closely related that it is difficult to determine where one ends and another begins. Technical skill is indispensable to efficient operation and it has greatest importance at the lower levels of administration. Human skill is necessary at every administrative level, while conceptual skill becomes more important as one ascends the scale, and is absolutely essential at the top.

The board of the company meets every Wednesday at 2 p.m. at the company's head office at 1 O'Connell Street, Sydney. *From left*: Mr G. B. Kater, Major General W. J. V. Windeyer, Dr R. W. Harman, Sir Edward Knox, chairman, Mr. J. G. Crowther, Mr J. W. Dunlop. The general manager of the company, Dr R. W. Harman who is also a director, is the only member of the staff who regularly attends board meetings. Other officers attend from time to time for discussion of particular matters.



Sir Edward Knox, chairman of the board.

Dr R. W. Harman, general manager.

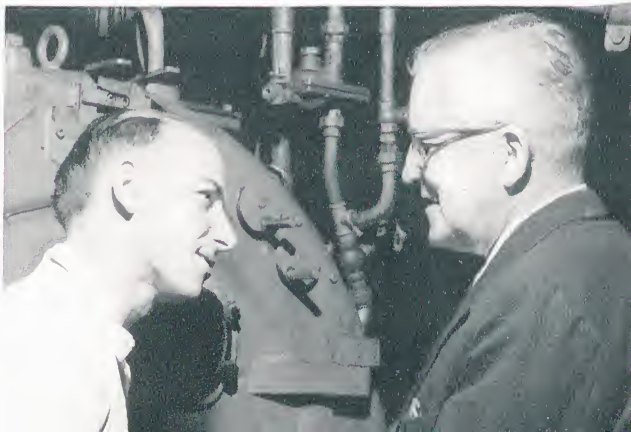
The general manager and four senior general executive officers comprise the general management group of the company. *From left:* Mr J. M. Dixon, Dr J. Vernon, Mr A. G. Carver, Mr. K. O. Brown (*foreground*) and Dr R. W. Harman.

From left: Messrs F. B. Longley, accountant, and P. T. Wheen, head of the sugar marketing division, confer with Mr P. J. Donnollan, chairman of the Queensland Sugar Board.

Mr L. F. Mallam, the company's general representative in the United Kingdom.

Refinery managers visiting Pyrmont refinery during a conference in Sydney. *From left:* Messrs A. M. Hooke, manager Cottesloe Refinery, W.A., G. L. King, manager Pyrmont, N.S.W., N. K. Sylow, manager Glanville Refinery, S.A., A. W. Blomfield, then manager Yarraville Refinery, Vic., now manager in West Australia, C. S. M. Walker, manager New Farm Refinery, Qld., and J. A. Wilson, head chemist Chelsea Refinery, N.Z.

Some members of the refinery development section. *From left:* Dr A. M. Hertzberg, Messrs L. L. Gilmour, J. A. Hosking and R. O. S. Shuttleworth.



Messrs M. S. Nossar, refinery development section, and A. C. G. Cameron, refinery inspector, discuss a newly installed Escher Weiss continuous centrifugal machine.

At conference of salesmen and distributors, building materials division. *From left:* Messrs T. R. Carruthers of J. Walter Thompson Pty. Ltd., the company's advertising agency, W. J. V. Windeyer, director, K. O. Brown, general manager of the building materials division, Sir Edward Knox, chairman of the board, Messrs R. A. Dickson of Dickson Primer & Co. Pty. Ltd., distributors of C.S.R. building products, A. C. Higgs, general sales manager, building materials division.

Salesmen, distributors and members of the office staff of the building materials division at a conference.

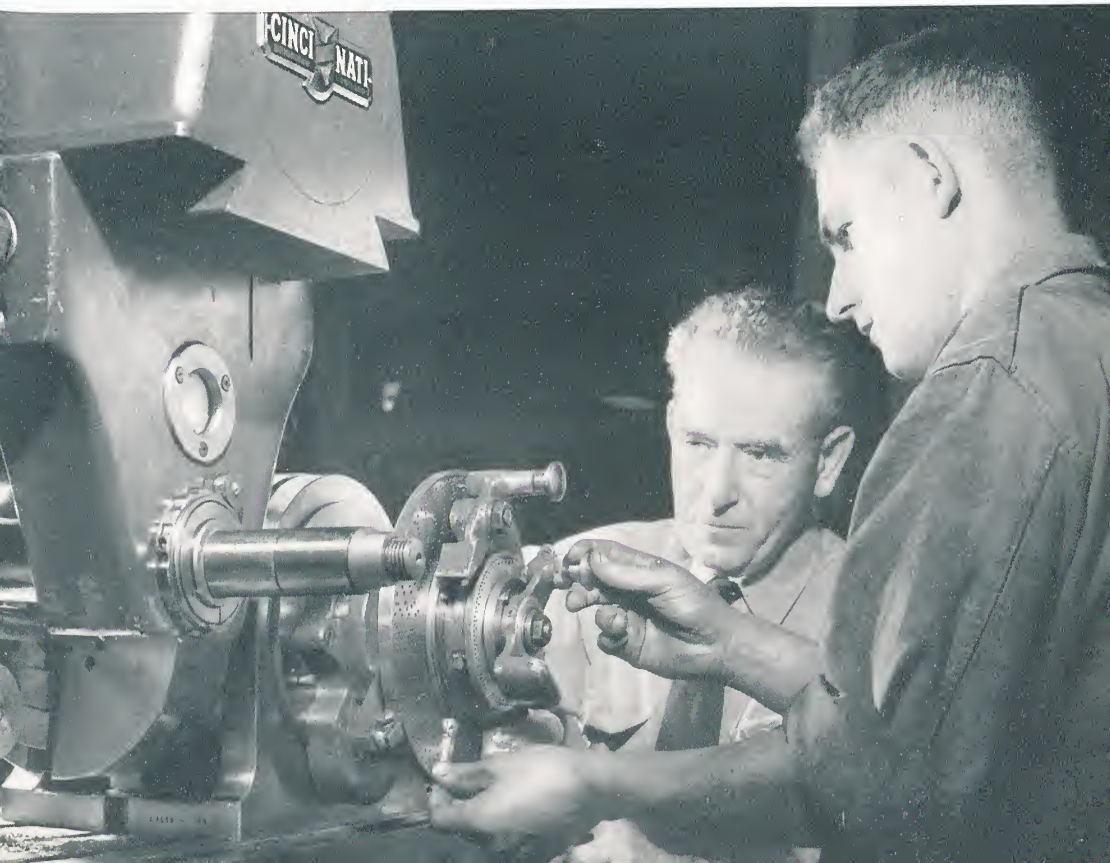
At the Rhodes factories of C.S.R. Chemicals Pty. Ltd. C.S.R. has a sixty per cent interest and The Distillers Company Limited of Great Britain a forty per cent interest in C.S.R. Chemicals. *From left:* Messrs L. W. Sweetman, A. J. Jarratt, general manager, and L. J. Thompson. Messrs Thompson and Sweetman are alternate directors in Australia for Sir Graham Hayman and Mr E. Stein of The Distillers Company.

The general manager, Dr Harman, inspects material in process at the pan stage at Victoria Mill, North Queensland. *From left:* Dr Harman, at microscope, Messrs W. A. Mestrez, chief engineer, R. L. Gordon, mill manager, R. Wilkinson, sugar boiler.

Messrs W. A. Gregory, acting secretary of the Pyrmont Sugar Workers' Union, and H. F. Wheen, head of the company's industrial department, check agreed terms of a new award.

Mr N. Lipovas, leading hand at Yarraville Refinery, is a Lithuanian by birth and came to Australia in 1949. Many New Australians are employed in the company's refineries.

Subforeman Mr F. C. Hunnam instructing apprentice Mr D. A. Avery in the use of a milling machine at the company's light machine shop at Pyrmont.



The secretary of the company, Mr F. A. Tindale, *seated*, and the head of the share department, Mr C. H. Lindsay. Shareholders' affairs are one of the secretary's responsibilities.

Mr F. Calmyre, chief accountant, *left*, with his senior assistants Mr A. G. Lever and Mr E. B. G. Millard.

At the entrance to Melbourne branch office. *At right:* Mr F. F. Evans, sales manager for the building materials division in Victoria, talks to Mr J. L. Tucker, manager in Victoria.

Mr J. H. Goldfinch, sugar sales manager for N.S.W., inspects a new pack for C.S.R. Coffee Sugar Crystals.

Branch managers' conference at head office. *From left, foreground:* Mr F. A. Tindale, the company's secretary, Mr L. S. Dalrymple, then manager in South Australia, now sugar marketing division at head office, *at rear:* Messrs J. L. Tucker, manager in Victoria, G. West, then manager in West Australia, now manager in South Australia, P. T. Wheen, head of the sugar marketing division, Dr J. Vernon, Messrs J. M. Dixon, K. O. Brown, senior general executive officers, A. J. Priestley, sugar marketing division, J. R. Kerr, manager in Queensland, A. C. Isaacs, manager in New Zealand, E. E. T. Layton, sugar marketing division.

Fiji managers' conference at head office. *From left, foreground:* Messrs C. Elliot, chief manager in Fiji, A. G. Carver, Fiji mill inspector, A. R. Rourke, manager Lautoka Mill, *at rear:* J. M. Aitken, manager Penang Mill, E. C. Hood, assistant to mill chemical inspector, J. C. Trivett, mill chemical inspector, C. O. Handley, assistant to Fiji inspector, J. C. Potts, manager Rarawai Mill, H. G. Nicholls, assistant Fiji mill inspector, Dr R. C. L. Bosworth, research chemist, G. S. Rowley, manager Lambasa Mill, E. G. Baber, chief technical field officer.

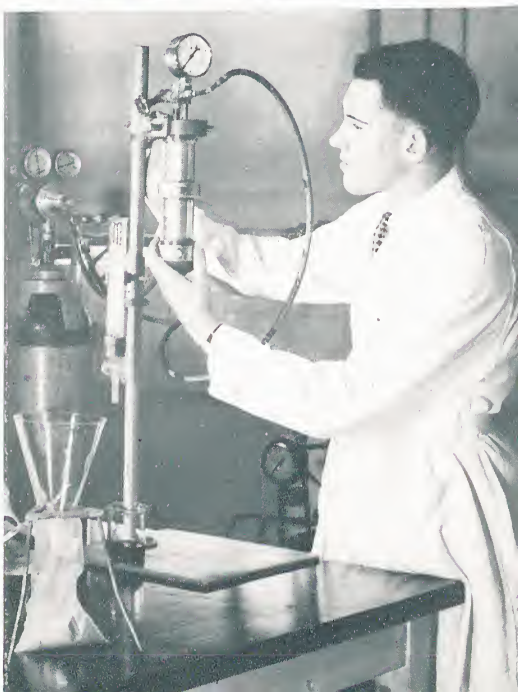
Discussing mill matters at the company's head office. *From left:* Messrs E. G. Powell, senior mill chemical inspector, K. L. Coates, head of the Australian milling division, W. M. Livie, senior mill inspecting engineer, and J. T. Alley, an officer of the milling division who is also mill-owners' representative on the Queensland Central Cane Prices Board.

From left: Capt. C. E. B. Carter, officer in charge of C.S.R. ocean vessels, and Mr H. W. Turkington, distillery inspector, confer with Mr C. W. Davis, chief chemist.

Above: One of a number of laboratories at the company's research department, Pyrmont. *At left:* Dr I. R. Sherwood, senior microbiologist.

Right: Mr C. H. McDonald, research chemist, operating a photoelectric spectrophotometer at the research department. This instrument is used to measure colours of liquids and transparent solids, to make turbidity measurements, and for colour-matching plastics.

Below: Miss D. M. Heddle, research department, distilling alcohol from a series of fermented washes as part of a controlled experiment to determine optimum quantity of supplementary nutrients required by distillery yeasts.

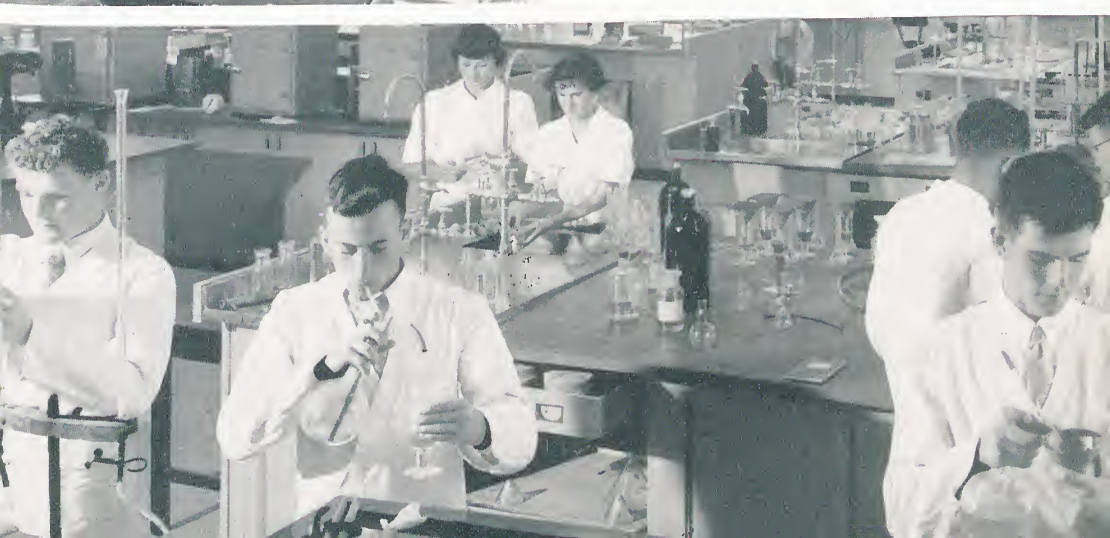


Right: Mr I. H. Brown, chemist, determining filterability of a raw sugar sample by means of a test filter developed by the research department.

Portion of the central technical library at head office. *In the foreground, at left:* Mr H. J. D. Meares, chief librarian.

Mr R. W. Rutledge, head of the central laboratory, and *from left:* computers Mrs J. Ciddor and Mrs N. Rutherford working on a linear programming problem, one of the techniques used in operations research.

Main laboratory of the company's central laboratory where analytical work is carried out.



The staff officer, Mr F. B. McAlister, interviewing a young man, Mr F. A. Davies, seeking appointment to the company's staff.

Mr R. C. Barnett, a junior officer employed in the staff department, deals with transport arrangement for officers and their families travelling on company's business.

All junior officers on the chemical staff are taught to become proficient at operating the saccharimeter, an optical instrument for measuring the concentration of cane sugar in a solution. The chemist is Mr N. R. Maclean.

Portion of the engineering drawing office at 1 O'Connell Street. Mr P. Cram, head of the company's central engineering services, discusses a plan with Mr R. A. Macdonald, principal design engineer. Miss P. Juergens on right.

Apprentice Mr T. G. MacDonald is instructed by Mr J. G. Paynter, supervising design engineer.

Bachelors' quarters, Victoria Mill, North Queensland.

Mr J. C. Potts, manager Rarawai Mill, Fiji, *on right*, having Sunday afternoon tea at the bachelors' quarters.

The dining room at the bachelors' quarters, Nausori Mill, Fiji.

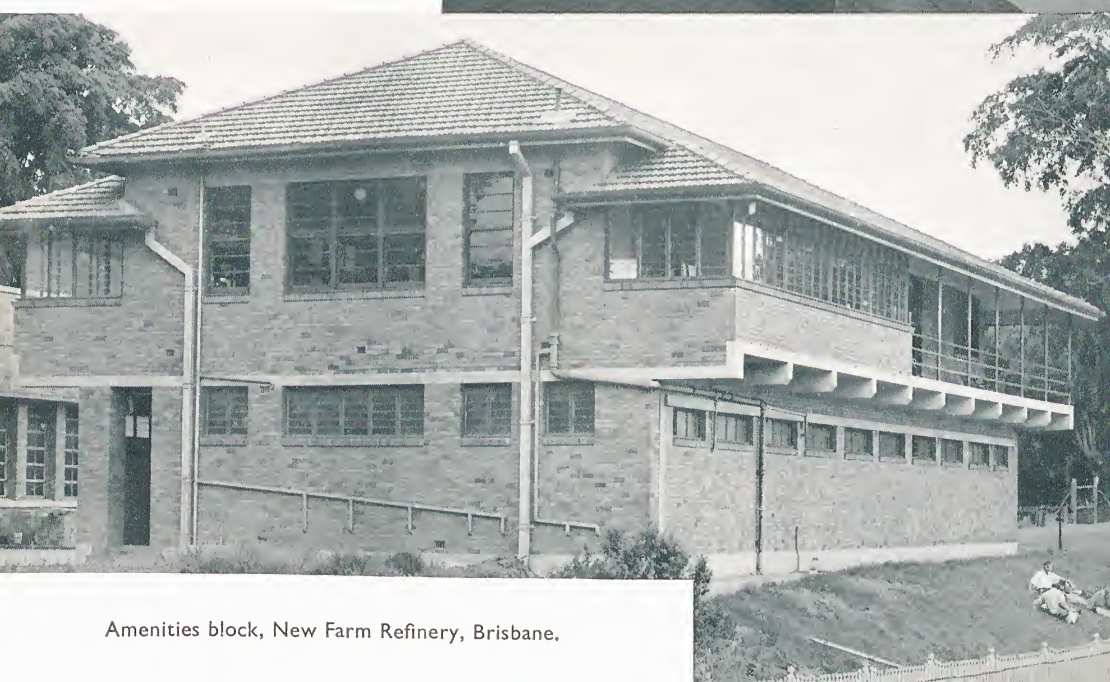
View from the manager's house, Goondi Mill, North Queensland. Mrs I. D. Bowling, the manager's wife, on the right.

The manager's house, Hambledon Mill, North Queensland. The manager, Mr M. Mackellar, at left.

Children of company officers playing in a garden, Rarawai, Fiji.

Employees' dining room, Yarraville Refinery, Melbourne.

Washrooms, Pyrmont Refinery, Sydney.



Amenities block, New Farm Refinery, Brisbane.

For years it has been the custom during February, when many officers are on leave from the mills in Australia and Fiji, for a cricket team from mills and other factories to play a team from head office—in recent years at the Sydney Cricket Ground. Many retired officers and officers from the factories around Sydney meet at the luncheon.

Employees' picnics at the refineries date back to the very early days. *Left:* Master J. Stone winning the boys' sack race at Pyrmont Refinery picnic.

Employees at the various factories organize a number of social activities. Most of the work is done by committees such as the Pyrmont Distillery social committee below. *From left:* Messrs W. Myers, F. Chirgwin, G. Watters, chairman, G. Thomson, T. Tyler, J. Irving, W. Cowan, W. Cruwys, *foreground:* W. Carroll.

Mr F. Pogson, glass blower, research department.

It will be noticed that I use the word skill, which implies ability to translate knowledge into action. Therefore this approach places emphasis on learning by doing. Also, consideration of what lies behind the words "technical, human and conceptual" will show that this approach calls for more than technical training: it lays stress on education in its broader sense; it calls for a continuance and broadening of education after school or university.

The Working of Divisions

The chart *Organization of Australian Milling Division* is an attempt to illustrate how supervision and control are carried out at the different levels and in the various sections in a distant branch or factory. There are differences of organization from division to division but the broad structure and method shown here will help the subsequent explanation.

While charts of this nature have their uses for purposes of illustration, they err in making what is essentially a somewhat complex situation look simple. No single chart can do justice to all functions and positions, for such diagrams suggest a rigidity which does not exist in practice. The chart of the Australian Milling Division does not sufficiently indicate the large amount of direct communication between line management and specialists in the central functional departments. Degrees of flexibility and shades of meaning are difficult to convey by a chart but in practice are most important. Also it must not be forgotten that a vital part is played by information and suggestions that flow upwards.

Throughout the company, and particularly in head office, the senior men of the various divisions and functional departments work in very close personal contact with one another and with general management, including myself. The utmost emphasis is laid upon free personal discussion amongst us and this, I think, is one of our great assets.

The managers of the various activities and factories in any one division are supervised and controlled in the management of their affairs by the "general inspector", an old title in C.S.R. His function nowadays approaches in many ways that of general manager of the division. He is assisted in the larger divisions by technical or specialist inspectors of his own division, such as the chemical, engineering and accounting inspectors, as well as by the central functional departments.

The general inspector of a division makes frequent visits to factories under his control as also do his specialist inspectors. These factories and other parts of the organization are also visited by me and by the other four members of the general management group.

The technical or specialist inspectors from head office regularly visit the factories and branches. They discuss all questions relating to the work with the local chief engineer, process manager, accountant or other section leader, as the case may be, and the conclusions to which they come are reported to the local manager who is responsible for the whole of the work done in his branch or factory. He may postpone for reference to head office the carrying out of any changes proposed by a specialist inspector if, after full discussion with the latter, he holds a different view of what should be done.

So far, this description has proceeded down the various levels of management from general manager of the company to general inspector or controller of a division, to manager of a branch or factory. There is still much more management to be exercised within the factory organization itself, for it is here that the bulk of our managing and supervising personnel are employed. Here are to be found one of the strengths of the company and the reservoir of supply for future senior management. These are the men who actually bear the responsibility for reaching the targets set for continuous production at high rate, reduction in costs, and greater productivity, and also for promoting good employer-employee relations.

There is a particular feature about our factory organization that should be emphasized. Our supervisors are technical men and supervise and control both process and operatives. To do this, they have been trained as chemists or engineers to control process and plant, and also in employer-employee relations to manage men; they acquire both the technical and human skills. Such a system has many advantages. It avoids dual control in a factory and our technical staff also become managers of men. This experience helps many of them when, later, they move up to local managership; and most of our senior divisional staff in head office have graduated in this way, gaining experience of both technical and human aspects of management.

Functional and Specialist Services

One of the advantages that a large company enjoys is sufficient volume of operations to sustain the cost of highly qualified specialist services and functional departments. When there are eight divisions, as in C.S.R., it would be wasteful and unnecessary to have, for example, eight industrial departments, one for each division. Although varying degrees of specialist autonomy develop, depending on the particular circumstances of each division, one central functional department, such as the industrial department, can service and assist most of the eight divisions and unify policy and practice to the necessary degree.

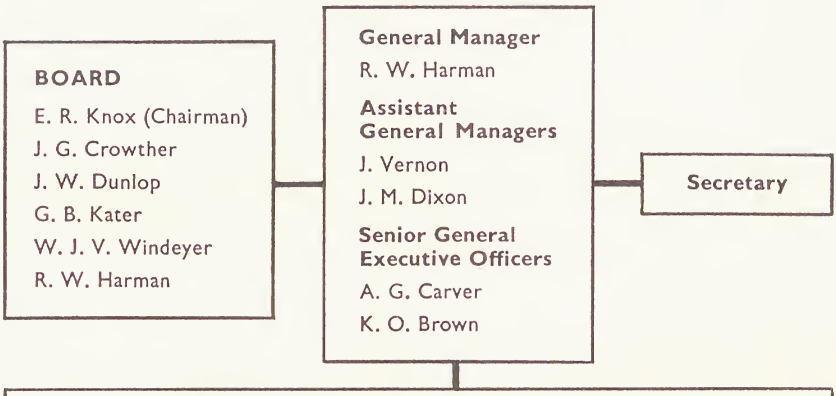
And the obtaining of efficient co-ordination of and co-operation between the divisions' line of control and the functional departments in a large company is a test of good administration. It follows that the results obtained by the operating divisions are in large measure due to the good work of the functional departments.

Those not familiar with an organization such as a manufacturing business may wonder about the distinction drawn between the "line" (i.e., production and selling) operations and the "service" (i.e., specialist or functional) departments, and may wonder about the administrative problem of getting the best intermingling of the two. This is not a simple matter and it could be discussed at great length, which is not possible here. It is probably a sufficient explanation to say that the line man in selling or production has to have clear and definite instructions to receive and pass on, so that he needs one boss, not two or more giving slightly varying instructions. The line man is fully occupied with his problem of initiation and control of operations and does not always have the time to study, investigate, develop and keep abreast of all new and specialist skills. Specialists have, therefore, developed in such matters as industrial employer-employee relations, technological research, cost accounting, personnel management, methods engineering, advertising, market research, and the like. The production and marketing men have to become knowledgeable in these matters and must take the responsibility for putting them into practice, with assistance and advice from the specialists.

Services and special functions are found inside a division, shared between two divisions, serving several divisions, or serving the whole company. This is partly indicated on the chart of the Australian Milling Division. This chart shows that this division relies heavily on its own head office functional officers—but it cannot clearly show that some of these are shared with the Fijian Milling Division. The chart does indicate, somewhat imperfectly, that the Australian Milling Division has available to it central functions serving many divisions; the Industrial Department, already mentioned, would be a typical example. Whether functions stay "central" and general (for example, Industrial Department) or become "divisional" (for example, Mill Chemical Department) is too detailed a question to discuss here.

The chart *Organization of C.S.R. Headquarters* shows that our main central (not divisional) functional departments are: the secretary, central accounting, central engineering, central chemical, research, industrial, and staff. I would note here that, as this is not a treatise on the theory of management, my separation into categories and my choice of labels are not to be taken as precise or beyond criticism from

ORGANIZATION OF C.S.R. HEADQUARTERS



DIVISIONS

Australian Mills: K. L. Coates

Fiji Mills: A. G. Carver

Refining: A. C. Cameron. *Includes New Zealand refinery.*

Sugar Marketing: P. T. Wheen. *Includes Sugar Board work, New Zealand sugar, Information Department.*

Building Materials: K. O. Brown

Distilleries: H. W. Turkington

Ocean Vessels: C. E. B. Carter

FUNCTIONAL DEPARTMENTS

Secretary: F. A. Tindale. *Includes Finance, Insurance, Legal, Share Register, Investments.*

Accounting: F. Calmyre

Central Engineering: P. Cram. *Includes Design, Eng. Specialists, Eng. Purchasing, Central Workshops.*

Central Chemical: C. W. Davis. *Includes Research Department, Central Laboratory, Technical Library.*

Industrial: H. F. Wheen

Staff: F. B. McAlister

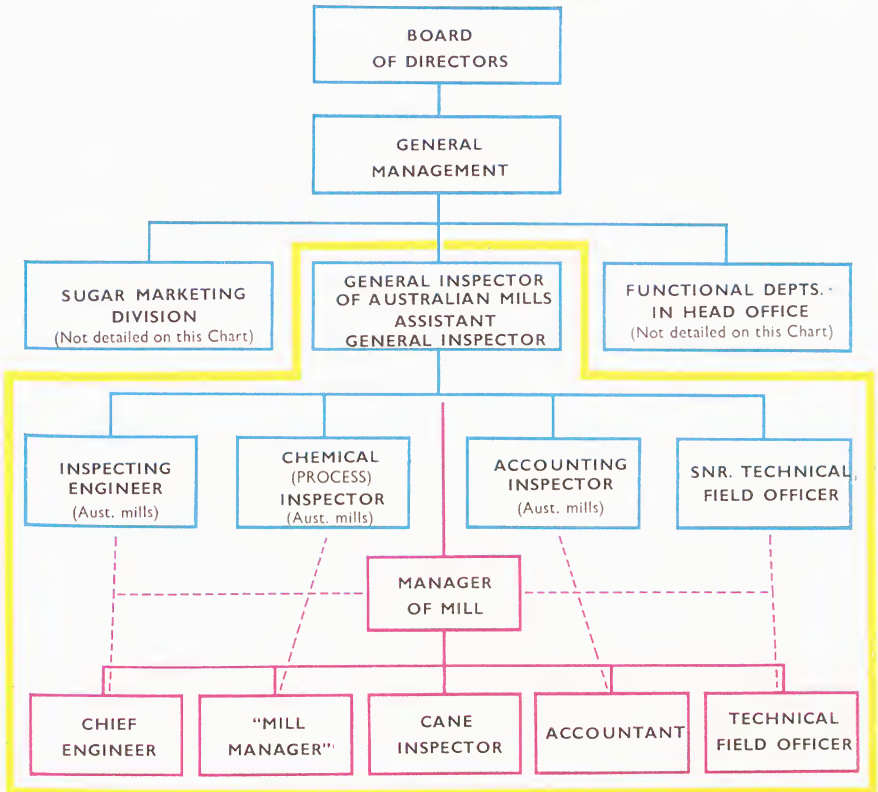
INDUSTRIAL CHEMICALS

The company's interests are represented by 60% ownership of C.S.R. Chemicals Pty. Ltd. **Board:** E. R. Knox, Chairman; R. W. Harman; J. Vernon; Sir Graham Hayman (Alternate—L. J. Thompson); E. Stein (Alternate—L. W. Sweetman) **General Manager**—A. J. Jarratt.

ORGANIZATION OF AUSTRALIAN MILLING DIVISION

This chart shows the Australian Milling Division of C.S.R. and its relation to the general direction and management of the company. The Milling Division is shown enclosed by a yellow border. It is partly located in Head Office and partly at the mills; functions located at Head Office are outlined in blue, those at each of the seven mills in red.

Continuous lines denote authority. Broken lines denote close association.


BOARD OF DIRECTORS
GENERAL MANAGEMENT
SUGAR MARKETING DIVISION (Not detailed on this Chart)
GENERAL INSPECTOR OF AUSTRALIAN MILLS ASSISTANT GENERAL INSPECTOR
FUNCTIONAL DEPTS. IN HEAD OFFICE (Not detailed on this Chart)
INSPECTING ENGINEER (Aust. mills)
CHEMICAL (PROCESS) INSPECTOR (Aust. mills)
ACCOUNTING INSPECTOR (Aust. mills)
SNR. TECHNICAL FIELD OFFICER
MANAGER OF MILL
CHIEF ENGINEER
"MILL MANAGER"
CANE INSPECTOR
ACCOUNTANT
TECHNICAL FIELD OFFICER

Plant operation and maintenance, second engineer, supervising engineers, tradesmen, unskilled men

(PROCESS & CHEMICAL) Sugar manufacture, analytical laboratory, despatch of sugar, chemical staff, leading hands, operatives

Grower relations, cane procurement, harvesting and transport of cane, tramline maintenance, assistant cane inspectors, loco and launch drivers and crews

Commercial, pay, costing, accounts, stores control

Cane breeding and selection, pests and diseases, agricultural trials, technical assistance to growers

* The functions referred to here, many of which have important applications to the Australian milling division, are *for the company as a whole*. The main functional departments *inside* the Australian milling division are shown, viz. "Inspecting Engineer" and others on the same horizontal line.

the point of view of fine definition. For classification by charts of this kind is not wholly satisfactory. Some persons—the secretary is an example—have some line responsibilities as well as functional responsibilities. Bearing in mind such qualifications I now describe briefly the activities of the *central* functional departments.

The secretary has duties and responsibilities in connection with shareholders' affairs and company law and practice. For example, in conjunction with the chief accountant he assists the general manager and the board in the preparation of the annual report and accounts. He has responsibilities also in connection with finance, investment, banking, real property, insurance and the Employees' Provident Fund.

The central accounting department carries out normal financial accounting and costing. It includes officers who inspect this type of work at the branches and factories, in much the same manner as the engineering and chemical inspectors supervise their particular spheres of operation at the factories.

Central engineering comes under the chief engineer. It includes the general designing office with about one hundred design engineers and draughtsmen, who do most of the design and detailed drawings for our factories. Also located here are specialist electrical, metallurgical and steam engineers, and some of the supervising constructional engineers. The chief engineer controls a well-equipped engineering workshop at Pyrmont, in Sydney, which fabricates specialized plant, repairs other plant, trains young engineers and trade apprentices, and provides general heavy workshop service for the organization.

The chief chemist controls the central laboratory, technical library and the chemical research department, and acts generally as adviser and consultant for all chemical work. The central laboratory is the main training ground for junior chemists and is also the main analytical laboratory. The technical library is, outside the Commonwealth Scientific and Industrial Research Organization, probably the best technical library in Australia, in regard to both reference books and methods of collecting and circulating information throughout the company. The research department at Pyrmont is one of the largest company-operated scientific and industrial research laboratories in Australia. Its main functions are to improve existing processes and to develop new ones.

The industrial department deals with wages and conditions of employment, awards, arbitration court and similar matters and its work is referred to in the next chapter.

Our staff department is concerned with conditions of employment of the staff and preparation of material for the annual review of their

salaries; with the engagement of new members, their induction into company procedure and their training; with transfers of staff from one section to another and their movement, including arrangements for moving their families and belongings; with recommendations to provide finance for officers to buy homes; with supervision of staff amenities and social functions, and care of some of the personal and domestic troubles of staff and pensioners.

An inheritance from our past, and a good one, is that the general manager shall deal personally with staff matters. This excellent practice would be impossibly burdensome with such a large staff without the assistance of the staff officer and his department.

While all the senior officers have much to do with staff matters, direct personal contact between the general manager and individuals on the staff is carried out extensively in C.S.R.—I believe to an unusual extent. Some people may think there is not time for me to discuss everyday affairs with seniors and many juniors, but there is time. When I and other senior officers visit the sites of our activities we not only inspect current operations but find time to discuss many things with our people, particularly their own individual opinions and affairs. An old-established and valuable practice continues of our officers, when visiting Sydney on leave, as many do, seeing me and the other senior officers, to talk about their work and about themselves.

The main review of salaries is carried out annually by a committee consisting of the general manager, in the role of chairman, the assistant general managers, the senior general executive officers, the senior heads of divisions and the staff officer. Other heads of divisions and of departments attend in turn at this meeting. Every officer in the company is discussed individually and often at length. Prior to the meeting of this review committee, staff reports have been written by heads of divisions and departments and managers of factories, and all these reports are read by all the members of the committee. By such methods we do our best to see that every officer receives individual and fair treatment. This method preserves balance in salaries among such a varied staff. Moreover, it gives everyone the maximum degree of equality of opportunity we can devise and assists to place men in the right jobs. The recommendations of this committee are placed before the board for confirmation.

Composition of the Staff

The three chief means by which the owners' capital is employed to attain the company's ends are the organization, the men, the leadership. So far I have been mainly concerned to outline basic concepts

and the organizational structure, but in doing so I hope some light has been thrown upon the kind of men in the organization and upon the matter of leadership. There is a good deal more to be said about the men who clothe the structure. Moreover, it may be questioned how C.S.R. makes those concepts and generalities which I have been discussing come to life as a growing, enterprising organization. The answer is—Men, with the required characteristics. And while this is to state an ideal answer which is not fully attainable, we strive towards it and believe we have some success. I think there is no better way to show how we try than to give some of the detailed facts and evidence about our men.

Most of our executive and supervising staff come to us straight from school and stay with us all their working lives; very many of our factory operatives and tradesmen, especially at places away from the larger capital cities, work for us over a long period of years. Ours is a career service and promotion is almost invariably from within, which emphasizes the need for a good proportion of young men of high quality among recruits. In a few instances we go outside our own service to obtain a man who possesses specialist qualifications which we have not previously had reason to develop. Men are judged first and foremost on merit, and there are many opportunities for advancement, because C.S.R. is not a single large factory organization but is really a collection of related enterprises, so that there are many responsible positions.

Although there is discipline, especially the discipline of hard work, we endeavour to treat people as individuals. Although there is concentration and stress by the management on costs and on production, we try to the best of our ability to regard all employees as contributors to our success and also as members—individual members—of the group. We endeavour to avoid measures which are authoritarian in tone. The disapproval or withheld approval of fellow members of the group acts as one important sanction. And the promise of approval is a stimulus towards high standards of discipline and *esprit de corps*. Naturally this has, in practice, different degrees of applicability and emphasis in different spheres of employment in the company.

The company has about 10,300 employees—7,010 in Australia, 460 in New Zealand and 2,830 in Fiji, of whom 2,320 are Indians or Fijians. The accompanying table shows the capacities in which the thousand members of our salaried staff are employed. The classification is somewhat arbitrary and perhaps goes too far in cataloguing people. Another way of classifying them would be to say that, of the 1,056, about 200 are juniors in training and clerical assistants and almost

all the remaining 800 occupy positions of responsibility. About 350 of the 800 are in managing positions, on a normal interpretation of management functions, and although I set out below the positions of the senior 77 officers in the company I would not like it to be thought that managerial responsibility resides only in these 77.

Senior Officers

General manager		1
Assistant general managers		2
Senior general executive officers		2
Heads and assistant heads of divisions		8
Heads of major central functional departments		6
Senior technical officers and technical inspectors		14
Senior specialist commercial officers		11
		44
Managers: Australian and Fiji mills		12
Branches (capital cities)		5
Refineries		6
B.M.D. factories		5
Other factories		5
		33
		77

Of these senior 77 officers, all except 12 came to C.S.R. straight from school; six of the twelve first went to universities and the other half-dozen joined after experience elsewhere, but still at an early age. In all 26 hold university degrees or accountancy qualifications. It is also interesting to look at the initial training in the company of these senior 77 officers, bearing in mind that there are many changes in training and experience for men who get to the top of an organization such as C.S.R. This early training was:

as chemists	32
as engineers	18
as commercial staff	15
as mill field staff	12
	77

The average age of the staff is 36 years and of the 77 senior officers 48 years.

The company has always given careful attention to selecting, educating and developing its men. We emphasize practical experience within the organization as well as continuing education. I look on this as one of my own chief responsibilities.

Manners, bearing and sound family background are useful indications of both personal integrity and balance. These things are sometimes thought to be oldfashioned, but we have no doubt of their permanent importance. We look for sound schooling, good character and personality; we look, too, for individuality, but not of the kind that will preclude a man from working as a member of a team. We like our young men to have played team sports at school; to have been leaders or prefects and thereby to have learned both to give and to take instructions; and to have been constructive and influential members of their school and local youth communities.

CATEGORIES OF C.S.R. STAFF

Senior officers at head office	44
Managers of branches and factories	33
Senior commercial and technical officers at head office	32
Heads of specialist departments at head office	12
Production managers	37
Process supervisors (mainly chemists)	76
Research and development officers	27
Designing and constructing engineers	82
Factory chief engineers	24
Supervisory engineers (factory)	85
Specialist factory engineers	35
Agricultural officers	21
Senior field staff (Australian and Fiji mills)	16
General field staff (Australian and Fiji mills)	71
Accountants and senior clerks	77
Marketing, sales and distribution officers	66
Commercial staff (various)	147
Miscellaneous positions (shipping, personnel, medical, library, etc.)	37
Juniors in training—	
Laboratory chemists and junior analysts	63
Commercial staff, mainly in head office and branches	51
Junior engineers, excluding apprentices	9
Junior field staff	11
	1,056

About 65 per cent of the present salaried staff were engaged direct from school to become chemists, clerks or engineering apprentices; about 10 per cent were first employed with us as weekly wage earners and were promoted to the staff; some 25 per cent had experience elsewhere before joining us, most of these having been engaged in the last ten years and while still at a comparatively early age.

About half of our young staff men have come from State high schools and half from private schools. About one-quarter came from country schools. Geographically, New South Wales has provided about three-quarters of the whole.

It is interesting to note that, of the thousand or so men on the staff, 162 are sons of company personnel (a few are of the fourth generation and a number are of the third; many are sons of C.S.R. wage earners) and 9 of the 162 are among the 77 most senior officers. If the proportion of sons of officers became too large it might have disadvantages, but in our experience there have been no disadvantages and there are certainly some advantages. One of these is that sons join the company with a full understanding of its character and work; they know what to expect and fully appreciate that they have to go to Fiji or Queensland or elsewhere in the service. We have a sense of satisfaction from the knowledge that so many fathers who have spent their lives with the company are glad to see their sons in the same service.

We prefer to engage those who have completed the full secondary course to university matriculation standard or have passed the Leaving Certificate examination or its equivalent. This is an essential for chemists and engineers as all new recruits in these spheres do technical training courses both inside and outside the company. Outside generally means a diploma course at a technical college or a degree course at a university.

Development of Men

C.S.R.'s long tradition of training of staff had its origin in chemical control of sugar manufacture. Sugar chemists were a non-existent race when we were developing chemical control of sugar factories. This led to the policy of recruiting young men for the chemical staff as they left school and training them in our own classes, which started formally in 1904. We believe we were the only company in Australasia, in the early years of this century, that gave any section of its staff a prolonged period of systematic training.

The growth of technical colleges and of suitable courses in our universities has changed this, and for some years now all our chemists, in addition to attending our internal classes, have attended diploma

or graduate courses at a technical college or a university, mainly in Sydney, our principal training centre. Their initial internal training is in subjects specific to our own industry, such as sugar analysis and special courses on process and labour supervision.

The company for many years has been noted for the high quality of its engineering apprentices. C.S.R. set up its own apprentice classes in 1906, for more distant factories as well as in the capital cities. The system is still in operation at our factories in Fiji, supplemented by correspondence courses. Engineering apprentices in Sydney now attend the University of Technology.

Our agricultural field staff is drawn in large part from chemists who have first had a few years' experience of raw sugar manufacture and then some experience at our own agricultural plant breeding and pathological stations, followed by specialist courses of one or two years at Sydney University. If they come through this satisfactorily, and it takes some seven years at least, they are given postings as junior technical field officers.

Besides the technical field staff, we have a large number of general field officers who organize the harvesting and transport of cane to the mills and generally are advisers to the growers. In Fiji the field officers must have a working knowledge of agriculture and they are also required to know the Hindi language and the customs of Hindus and Muslims because the growers there are, for the most part, Indians.

We use the omnibus term "commercial staff" to cover many different categories, some of them quite specialist, such as salesmen, accountants, junior industrial and personnel officers, purchasing staff, insurance men, shipping officers.

The training of our commercial cadets has not been so highly systematized as that of the technical cadets. One reason for this is that few basic courses exist and the men concerned are thrown more on their own resources and on internal company resources. All the juniors on our commercial staff are not, therefore, required to undertake formal courses, but they are encouraged and assisted to study economics, accountancy, cost accountancy and other like subjects. There are at present 43 men on the commercial staff with economics degrees or diplomas or accountancy qualifications, and there are many juniors studying these subjects while working and acquiring practical experience at the same time. If their external courses require it, a reasonable amount of time off is allowed without loss of salary.

I am convinced that in many organizations there is a large proportion of men who can be trained and educated to make successful managers

or administrators. Without question, the yield can be greatly increased by starting with a high average quality of stock—in education, character, family background and intelligence. But the best administrators will develop only if the organization makes a conscious effort to educate and develop them and if the individuals continue to educate themselves.

Our development for senior positions is carried out in various ways. Job rotation and experience under different seniors is important. There is no real substitute for learning by doing. Those who stand out clearly are pushed ahead. The best recipe for success is doing a good job, wherever posted, and standing up to the pressure of hard, sustained work and responsibility. We make a deliberate effort to see that the promising man gets experience inside the company and encourage him to get wider outside experience; his development, his gaining of knowledge and experience go on until late in his working life.

Juniors and seniors alike are encouraged to belong to various professional bodies, such as the Royal Australian Chemical Institute, the Institution of Engineers, the Institute of Management and the Australian Society of Accountants. Many of our officers have taken leading parts in these associations.

For a company such as ours, it is necessary to have some men with higher university degrees. We recruit some graduates direct from the universities, particularly for our research department, where they may stay or whence they may be transferred to production work. We also select officers who have already shown that they will progress in the company to study for higher university degrees. All of those selected have done well and some half-dozen have been sent to English universities to obtain doctorate degrees. We place these men under no bond to stay with us but we pay their salary and their university fees and expenses.

We always have a few men making visits overseas. Most of these visits are specific business missions, but they are undoubtedly helpful to the individuals and the organization in broader ways. While overseas visits are not confined to sugar business, there is no sugar-producing country of note which our officers have not visited or with which we have not exchanged information. We also send our people to conferences, technical and commercial alike, in Australia and overseas. An example of this is the triennial meeting of the International Society of Sugar Cane Technologists, two meetings of which have been held in Queensland and others in Cuba, Puerto Rico, Hawaii, and Louisiana; five of our men have recently returned from the latest congress, held in India.

For management and administration, for work study and personnel work, learning by doing and by direct coaching from superiors has recently been supplemented by more formal training courses, both inside the company and externally. We have made considerable use of management courses available at technical colleges, at the Institute of Management, and from firms of management consultants. Quite recently three senior officers have had the benefit of overseas courses—two at the Harvard short course in Hawaii and one at the Administrative Staff College at Henley-on-Thames.

We aim through training to improve both our men and our methods of work, and not technical or process methods only; to have well-trained and interested operatives and tradesmen working under good conditions by well-conceived and well-planned methods; to have supervisors able to instruct, lead and control, and especially aware of what is needed for good performance of their job. Older methods of development, however, had their good features. And, when I see around me the surge of interest and enthusiasm for the study and the application of improved methods of management since the last war, much of which I have myself encouraged, I like to remind people not to forget the basic principles of the past, not to get lost in the new techniques, but to use them as an addition to the best features of the old; not to forget that there is no escape from the fundamental requirement that a good supervisor must be on the job and get good discipline through his own knowledge, application and leadership.

The contract of staff engagement provides that each man shall serve wherever directed. He may be engaged in Perth, be transferred to Fiji, then to Queensland, then to head office. Only by this kind of mobility can our particular needs be met in all our places of business and manufacture. It is also most useful for broadening experience, for checking on responsibility and adjustability, and for actually effecting promotion.

Vacancies in comparatively junior positions are filled mainly by young men who are being moved from one position to another as part of their experience. For higher positions, care is taken to consider all possible candidates for each vacancy. The initial list for a vacancy usually contains the names of a considerable number of men and full discussion among senior officers takes place before the choice is made.

Women stenographers and typists were not employed in the company until the mid-thirties. The number rose during the war to 240 and there are now about 200, mostly in Sydney. They fill positions as clerks, secretaries, stenographers, telephone operators, receptionists, analytical chemists, librarians, and so on. They make a large contribution to our operations.

Employee Services

Like most other large organizations in advanced communities the company provides a number of services for its employees. Some of these were quite exceptional when introduced into C.S.R. during last century and, although in recent times similar services have been rendered by most employers and to an increasing extent by the state, I think we have continued to hold a leading place in this respect. The company has long contributed towards employees' life assurance and pensions, operated a long-service leave scheme, assisted employees to buy their own homes, provided housing in remote areas, and made up the pay of those engaged in defence training or on war service. Support by the company for the employee's own efforts is the guiding principle—a principle enunciated by E. W. Knox in 1892 when he remarked that "a pension, however large, is dearly purchased by a sacrifice of any portion of the independence of spirit which you should all possess" (see Appendix 6). The contributions towards helping its employees are therefore neither ungenerous nor extravagant—for any extravagance in salaries or associated benefits must be paid for either by shareholders or by consumers.

When C.S.R. Employees' Provident Fund was established in 1890 it was the first of its kind in this part of the world. "We are employees of the largest and most enlightened commercial undertaking in Australia," one of our factory managers at the time told his men, " . . . this fund is only one more evidence of its continually progressive character." Both the company and members contribute to the fund. Main benefits are life assurance and pensions on retirement. The fund is a separate entity, quite distinct from the company, being controlled and managed by six trustees—a director, the general manager, two salaried officers and two foremen. There were 1,194 contributing members at 30 June 1955, and 366 members receiving pensions. One-third of the investments of the fund are shares in C.S.R., giving the members of the fund (and virtually all the salaried staff are members) a close interest in the success of the enterprise—a point of some interest to the general body of shareholders and representing a real and properly-earned form of profit-sharing. Inflation has robbed the older pensioners of much of the real value of their early contributions but the company has appreciated the social injustice brought about in this way and has directly supplemented pensions to ease the situation.

A factory employees' assurance scheme, run in conjunction with the Australian Mutual Provident Society, provides factory employees who elect to join it with life assurance and a lump sum of up to £2,500

on retirement. The company subsidizes this scheme £ for £ of employees' contributions, to the extent of about £50,000 annually.

The amount advanced to employees for house loans and not yet repaid stood at £791,000 at March 1955. The total advanced under this long-standing scheme and the number of homes built are, of course, much greater than this balance would appear to indicate.

We encourage our officers to become members of the peacetime army, navy and air force, and give them time off for citizen defence training. During the two world wars the pay of employees on war service was made up if they were earning less in the services. We are proud of our employees' wartime records. As an illustration, I cite the figures for our salaried staff for the two world wars. There were 429 on the staff in August 1914, and 154 of these enlisted during the first World War. Others who joined the staff during the war and enlisted later brought the total enlistments up to 231. Of these 203, including our chairman, saw active service; 37 were killed. During the second World War it was necessary to retain more officers in production work at home. 284 from a staff of between 700 and 800 enlisted and many more would have done so if they had been allowed by the authorities; 39 were killed.

The Art of Business

J. M. Keynes expressed the opinion that "it is safe to say that enterprise which depends on hopes stretching into the future benefits the community as a whole". But he thought that individual initiative would be adequate only when "reasonable calculation is supported by animal spirits". A mere description of the organization and manning of an enterprise, of managerial attitudes and skills, of the type of working life we provide for our people, cannot convey an understanding or appreciation of the vitality of the company or of the infusion of "animal spirits" which helps to make for economic growth and the avoidance of a static economy and static life. One of the factors which gives assurance and confidence to our people is, I think, the conviction that the activity of production and the process of economic development in which they are engaged is a worthwhile task.

I think it is also fairly widely appreciated among our staff that economic development is a necessary condition, although not the only condition, for many other kinds of development. To some extent it presents an end in itself, but it is also a means to other socially desirable ends. The nature of economic development, the ends it serves, and the means employed to reach those ends, are factors which influence the attitudes of men. In pursuing their immediate ends I think most of our people seek means which pay regard to the rights and liberties

of others, and look towards more distant ends which promote political and social, as well as economic, well-being.

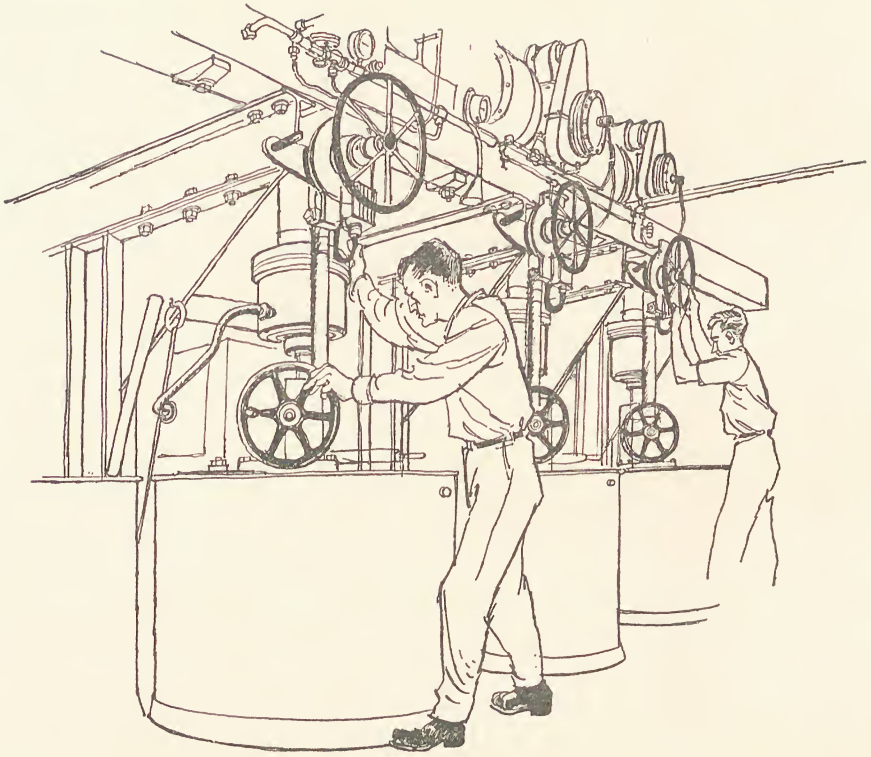
Although applied science holds an important place in industry, there is no science of ends and means to guide men in conducting themselves in their business affairs. Because we are a prominent business with a highly organized structure, some people assume that we could, if only we would, tell them our "formula" for making business decisions. Some seem to think that if the formula were disclosed any generally intelligent person over 30 years of age could apply it with quite adequate success. In truth, nearly all major business decisions are influenced by factors incapable of precise definition or measurement; many such factors are not of either a physical or an economic nature; many of them are in a constant state of change; situations do not repeat themselves very frequently because one or more of the factors is generally found to be different. The question of profitability is of course with us all the time. There can be no future existence for us if we do not operate profitably in the financial sense. Monetary profit, as an economic criterion, is the *prima facie* evidence of efficient operation, and because of that is a constant objective of our activity. A high degree of preoccupation with profitability provides also a fair measure of assurance that our activities are indeed economic, in a wider sense.

How to make a profit, and to continue to do so in the future, is usually a complex enough problem, with nothing automatic or certain about its solution. But there are many other problems which the businessman must face, other objectives to attain, and other considerations to which weight must be given. The requirements for the best business decisions in an organization of our type are that able and responsible men, possessed of technical, human and conceptual skills, with detailed knowledge of the trade or industry, and endowed or imbued with enthusiasm and "animal optimism", should have all the hard-to-get facts and considerations in front of them. Such a standard of perfection is rarely fully attainable in practice but it is a standard we consciously try to reach. In coming to decisions and in carrying them out, the following factors operate:

> Responsibilities lie not in one or two directions only, but must quite consciously extend to shareholders, customers, employees, creditors, suppliers, and the public interest.
>
> Decisions must take into account physical and technical considerations, more difficult financial, economic and political matters and the effects on and reactions of many human beings.

It is certainly not the past and hardly ever the present which is at stake; present decisions and actions inevitably affect the future. Decisions must almost always be made in the here-and-now against the pressure of time and circumstances; problems can seldom be left for Time to bring a solution.

Businessmen cannot afford to try to be right in every respect every time—too conscious a concern in that regard would mean delays, which are the enemy of action, and too little would get done. One of their functions is to take risks—calculated risks. Their art is to be right most times, wrong seldom and where it least matters.



CHAPTER 13

People and Work in Factories

R. W. HARMAN

This company, employing over 9,000 wage earners in its factories and other establishments, has a major responsibility and wide experience in the field of labour relations. In this chapter Dr Harman reviews the changes that have occurred in the relations between management and wage-earning employees with the growth of the arbitration system, considers the need for improvement and development in that system, and puts forward suggestions for changes in some traditional attitudes of both employers and trade unions in the light of full employment. He translates these reflections into practical terms in describing C.S.R. policy and practice towards the people who work in its factories.

March 1956

It would take a more able pen than mine to convey a full understanding of the intrinsic nature of the relations which obtain in our factories between management and the men whose work contributes so largely to our existence. Troubles we have and enough at times, but satisfaction we get too. Perhaps it would help to describe an incident that occurred when I took Senator Richard Nixon, Vice-President of the United States, around our Pyrmont sugar refinery in 1953. He talked to men in various parts of the factory and to his questions the first four or five men replied in these terms: "I've worked here 45 years . . . 37 years . . . 28 years . . . . Yes, I like it . . . . No, I don't want to change." Senator Nixon turned to me and said: "Well, that explains a lot about you." And then the very next group consisted of three or four New Australians who could not understand him nor could he understand them. Whether it be at the Pyrmont sugar refinery in Sydney, or the Victoria sugar mill in Queensland, or the Lautoka mill in Fiji, most of the men in our factories are glad to be with us, I think, and we with them. The "solid core" of the company's work force consists of men who have been in our employ for many years and intend to stay.

The factors which make for satisfactory *personal* relations in our factories are much the same as in any sphere where people work together. I shall try to keep to what I think are the more important aspects—to outline the main features without too much detail. The questions of policy and practice that arise for the company in connection with our factory employees are in many respects the same as those which concern salaried employees, but there are significant differences. It is not our wish that there should be distinctions but it is inevitable, for a number of well-known reasons, that differences exist. In our service the distinctions were much less before the advent of compulsory arbitration and of highly-organized unionism, and it is our aim to reduce such distinctions.

Wage earners often seek advancement or a change of occupation by changing their employment. A proportion are not particularly ambitious, but desire to remain mobile and to change employers and even occupation from time to time. Others wish to stay where they are but prefer to avoid responsibility for getting work done according to plan and through the supervision of other people. These are, of course, perfectly legitimate individual choices. Many do not intend, as most of the salaried staff do, to seek responsibility and to make a career in C.S.R. Most salaried staff positions, especially in industries which are becoming increasingly technical and specialist, require above-average standards of education—tending more and more to longer schooling, approaching or reaching university standards.

Promotion for salaried employees also depends greatly upon themselves and their wives and families moving in our service at short notice from place to place, State to State, and even from one country to another.

Opportunities to promote and advance wage earners to the salaried staff are taken; and we are trying to do more of it. At present about one in ten of our total salaried and supervisory employees started with the company as wage earners, and some of them are filling very senior positions. There are, also, many sons of C.S.R. factory men on our salaried staff today. We have had some success in giving wage earners who are willing to accept responsibility, who have ability and who wish to stay in our employ opportunities for improving their status, pay and other satisfactions.

The Influence of Trade Unions

Most wage earners belong to industrial unions, and their wages and hours of employment in Australia and New Zealand are determined largely by the machinery of the arbitration system. Industrial unions are part of the modern order of society and can have a responsible social role to perform but, in the context here under discussion, it seems pertinent to note several aspects of their tradition in Australia, New Zealand, and the United Kingdom which stemmed originally from understandable causes now largely inoperative:

> Their tradition emphasizes elements of opposed rather than common interest in their members' relations with employers.
>
> Their tradition sets little store by increasing productivity—indeed it has tended to emphasize restrictive practices.
>
> Their outlook towards the future tends to be pessimistic and obsessed with memories of the depression of the thirties.

A few union leaders, often for political ends, exploit these negative traditions and bring to the industrial field attitudes more appropriate to civil strife. Looking back, I would say that the leaders of the unions which are more exclusively connected with the sugar industry have acted generally in a responsible way, although in accordance with tradition they have been ready to assert union authority and power and to promote the idea of the union, rather than increasing productivity, as the real source of improvements for workers. Between operative and supervisor at the factory level such attitudes have only a limited influence, but to some extent they do permeate to the rank and file of union members and tend to discourage responsible co-operation.

Confronted by this somewhat negative but nevertheless aggressive

union tradition, employers in the main have been on the defensive to too great a degree, too disposed to adhere to the older order, too unimaginative. To be forced on to the defensive is an almost unavoidable consequence of facing an aggressive, proselytizing force, backed by a substantial body of public and governmental opinion. But we cannot overcome such a situation by merely unconstructive opposition. An Australian trade union leader reviewing a recent book on the history of British trade unions said, "The *Magnificent Journey* of trade unionism begins in despair and ends in power—but what of responsibility? . . . How can the basic aims of unionism . . . be reconciled with the democratic needs of modern society?" This is a timely challenge to unionism, but it seems to me important that private employers, notwithstanding that their journey has been much more magnificent in its achievements for whole populations—including employees, should ask themselves the same questions and find answers that will be acceptable to society.

The answers, I take it, must be found in reconciling the interests of the group with the interests of society. The *Observer* (London) recently published an article which included the following remarks, and they are as relevant to our situation as to Britain's:

> But the intelligent and successful pursuit of group interests in a highly competitive, full-employment economy requires from all concerned a radical readjustment of attitudes that were formed in response to quite different conditions, when Britain suffered from chronic unemployment. . . . Today, when these conditions are precisely reversed, the intelligent pursuit of group interests calls for a new understanding of the importance of fighting inflation, raising productivity, and maintaining a continuous flow of production.
>
> Unfortunately, this realistic grasp of the contemporary situation is not yet at all evident in the trade union rank and file. Much more obvious is the persistent influence of old, out-of-date theories and ideas.

The points I have been discussing are important to this company because of its large stake in the community and its correspondingly large responsibilities to that community. More particularly, sustained high output of goods at lowest practicable cost is an aim which we, like any other manufacturer, strive to achieve. Many factors contribute to the achievement of this aim, but willing and competent work by factory employees and freedom from stoppages and restrictive practices are important. In circumstances where the balance of power as between

unions and employers is unduly weighted on the union side, industrial peace may sometimes be purchased by paying uneconomic wages or by following inefficient practices in manning factories, but such sacrifices of efficiency to false harmony serve only to decrease output per man and add to costs of goods. Our own interest and what we believe to be our responsibility combine to influence us to strive against inefficient practices in wage rates and manning and towards higher productivity—an objective which may be prompted largely, but not exclusively, by motives of profitability but which, in its achievement, confers benefits as well on employees and the community generally.

C.S.R.'s Broad Industrial Policies

Our industrial policy has, therefore, to be reconciled with our business aims and with the conditions referred to above; and the policy which we have evolved may be stated briefly as follows: we try, even if we are not sufficiently successful, to give our people satisfying employment, recognizing their importance as persons and the worth of their work, providing them with opportunities to use their abilities and to accept responsibility; we attempt to communicate some appreciation of the importance of the social task of goods-production in which both wage earners and management are engaged; we try to establish understanding of the breadth and scope of the field in which employees' and employers' interests are both common and reciprocal, and to minimize the residual area of conflict; and we seek to resolve conflict in this residual area by orderly and regulated processes. In other words, we view the field of employer-employee relations as consisting of a large area where employer and employees are themselves jointly responsible for the nature and quality of relations between the two parties, and a smaller area where those relations require for their orderly regulation some instrument or authority such as the arbitration system provides in Australia and New Zealand, or the formal conference provides in Fiji.

The Influence of the Arbitration System

In practice these two areas of the industrial field—that of basically common interest and that of potential or actual conflict—overlap; and the means adopted to resolve conflict have considerable influence on internal industrial relations. The arbitration system, for instance, has been responsible in some ways for creating arbitrary distinctions between management and wage earners. Sir John Latham has remarked that "The system emphasizes differences and not co-operation"; it

has also tended to dehumanize a fundamental social relation. The individual human being and the respect due to him are often overlooked in the heat of legal battle; and in the rulings and awards of the courts the individual is generally submerged in broad groupings and collectivisms. I believe that the remedy for this situation lies partly with employers, who have served neither their own nor the public interest when they have too easily allowed the courts, or the unions, to take over so many of the normal responsibilities towards the men they employ.

As the employer of a large number of men in scattered places C.S.R. obviously has a deep interest in the functioning of the arbitration system. The system profoundly affects our operations and we have a great deal of experience of it. We are subject to the industrial courts and tribunals of the Australian Commonwealth, five States and New Zealand. In all we have employees working under 123 different awards.

There is a weakness of the arbitration system which has significance in a wider field than industrial relations, and which has tended to detract from the prestige of the system with both employers and employees. I refer to the weakness the system has shown where economics is concerned. Holding what probably amounts to as great economic power as any Australian institution except government itself, the wage-fixing system is not even provided with an index of productivity. It seems, indeed, that the courts, while speaking in the language of "the capacity of industry to pay" and "proper wages", have not had sound economic data to guide them. Australia is not a closed economy and is likely to be in continuing difficulty with the stability of its currency and its ability to export enough to maintain its balance of payments, yet it has rested almost entirely with employers to serve the public interest, as well as their own, by opposing before the courts general wage increases not matched by increased productivity.

The Australian and New Zealand arbitration systems appear to have public opinion firmly behind them as broad means of regulating issues between employer and employee not readily solved by other methods. And these systems have been thought of in Australia and New Zealand as a social advance. In such a wide context they have not, as yet, a long history and are doubtless in an evolutionary stage. Mr Justice Higgins' famous description of compulsory arbitration as a "new province for law and order" puts in a vivid phrase the ideals that prompted its adoption. The description indicates that it is presumed to have behind it the resources of law and jurisprudence—with all the

prestige that belong to them in British countries. I think it would be generally agreed that law, to be effective and to result in order, rests heavily in the longer run upon widespread and general respect for it, and this, in turn, depends greatly upon impartiality. It cannot succeed if respect for impartiality is impaired. Also, it seems to me, law and order require, in addition to the support and respect of public opinion, sanctions against transgressors, for "law and order" connote compulsions of some effective kind. Chief Justice Earl Warren of the United States recently said, " . . . no other means of social peace but these two—the law of force or the force of law—are likely to be known to man."

The requirements of impartiality and of general respect are easier to maintain when a tribunal's functions do not extend beyond the administration of justice according to law. The vesting of arbitral, legislative and judicial functions in the industrial courts and the difficulties arising from the close association of these functions, which are normally distinct and separate, have detracted from the influence and prestige of the industrial arbitration system—and perhaps from the prestige of our courts of law in general. Sir Owen Dixon said, on the occasion of his appointment as Chief Justice of the High Court: "There is in Australia a large number of jurisdictions and a confusion in the public mind as to the functions the jurisdictions possess. The character of the functions is misunderstood and the public do not maintain the distinction between the administration of justice according to law and the very important functions of industrial tribunals." It is hoped that in the Federal industrial sphere the recent amendments whereby the arbitral and legislative functions are separated from the judicial function will be an improvement.

Another major difficulty the arbitration system faces in Australia is to be found in the existence of several State jurisdictions and the Federal jurisdiction, the differences between them and the varying degrees of respect they command. These are fields where improvements can be brought about by governments, or by public opinion as the spur on governments.

The arbitration system has had to contend with difficulties of other kinds. Widespread popular misconception about economic and social history, especially about the sources of, and the measurement of, increasing material welfare; the deep suspicions and some animosity inherited from the past and re-enlivened by the depression; the underlying struggle on the union side for political power: these and other factors have combined to reduce the degree of acceptance of and respect for the arbitrator's decisions.

In important matters affecting our society, and where major pressure groups and organizations clash and seek too often to impose their will by exercising their great powers against the community generally, there seems to be no alternative but to impose, *when all else fails*, disciplines designed to avoid the social disintegration that will otherwise follow. At the same time one can appreciate that the reluctance of governments to provide powers for the vigorous and rapid application of penalties is associated with a genuine dislike for coercive and punitive measures—especially in the case of governments which do not believe in increasing the authority and scope of the central government and believe in what we call democratic freedom.

Latterly, a return to a system of collective bargaining has been mooted for Australia. While I think there is scope for more and more responsible negotiation, I have recently come across some comments by Dr E. Sykes, Senior Lecturer in Law at the University of Queensland, and I believe they are worth repeating here. Dr Sykes wrote: "When the compulsory arbitration system was introduced at their [the unions'] instance they were definitely the weaker party, and they were quite content to see employers compulsorily forced to pay minimum wages and to observe award conditions." Dr Sykes added, " . . . Australian arbitration courts have always insisted that there are three parties to be considered, the employer, the employee and the general public. Under a pure collective bargaining system, the decision will depend on the relative strength of the parties, and the public can go hang. A voluntary collective bargaining system will function efficiently only if the parties are approximately equal in bargaining strength."

Despite some weaknesses in our arbitration system, and many people have commented on them at length, I do not suggest that the system is basically an unsound one. It has not served employees badly, and employers' dissatisfactions lie mainly, I think, with some aspects of method and application and not with fundamentals. I believe we should be considering how to improve the system—not how to abandon it or replace it, for I believe its weaknesses are not fundamental. Conflict and tensions will never be eliminated—nor is it desirable for the sake of progress that they should be—but there is a big field of mutual and common interest for employer and employee to cultivate. In Western society there is also, to temper the conflicts, the basic respect which man owes to man and the majority owes to the minority. Against the background of that tradition there is much that could be done, by unions, by employers, by governments, through education, economic and otherwise, to improve the situation.

C.S.R. Practice under Arbitration

The company criticized compulsory arbitration when it was proposed and gave reasons, some of which have been borne out by events, but it did not appreciate and foresee several of the consequences which it might have been able to mitigate in our service to a greater extent than it did. The new rules were adhered to strictly by the company and, for the most part, the unions in the sugar industry accepted arbitration and worked smoothly within the system. The company set up a central industrial department to deal with arbitration matters, to supervise our obligations under the numerous awards, and also to deal with other industrial conditions and practices established in our factories over the years such as retiring allowances, long-service leave, sick pay and finance for home building. This industrial department was one of the first of its kind in Australia and became expert in industrial procedures and law. Its interpretations were widely accepted, and there was respect between union officials and the company's industrial officers.

Once the arbitration system became established the company accepted awards as binding contracts and viewed strikes as morally wrong. The unions knew that strikes could not force us to depart from the award. But this policy also meant that situations should not be allowed to arise in which men had serious and genuine grievances. These and other factors played their part in keeping industrial disturbances in the company at a low level. Indeed, in 100 years, with 14 factories in Australia in 1900 increasing to the present figure of 22, there have been only ten strikes in our factories lasting more than one day (and concerning the company as distinct from State-wide or industry-wide stoppages).

While the level of wages in our factories has not exceeded those found in comparable industry, for many years our negotiations with the sugar workers' unions in Australia and New Zealand have been conducted with comparatively little recourse to arbitration—a situation more easily achieved when only one employer is concerned. This has been possible because both parties approached the negotiations in good faith and with practical understanding of the industry. For the most part, also, the employees' representatives have brought to conference the views of the men they represented, and have not viewed the discussions as a means to political ends. Negotiation is almost impossible when union leaders consciously exploit, or even provoke, points of difference and opposed interest, and use the industrial field as an avenue for promotion of their power or their political advancement.

(For this reason alone it is difficult to see how Australia or New Zealand could manage at present without the arbitration system or something akin to it.)

Most unions in the sugar industry have seen the advantage to themselves and to the public interest of maintaining the system of arbitration and have been prepared to accept its decisions. But, especially since the pressure of full employment has been felt, defects in the system and, at times, the weakness of employers and the timidity of governments in supporting the courts and handling those who did not accept decisions made the position of the unions endeavouring to act within the system almost untenable.

The Influence of Full Employment

The arbitration system and highly developed unionism in Australia and New Zealand are factors which have great influence on the nature of the general social environment in which we operate our factories. We have no control over and little influence on these external factors, but the character and quality of relations between management and men in our own factories depends in the longer term substantially on ourselves. We have been devoting much attention to such matters and have been reviewing our attitudes and policy in this field, basing our thinking on the premise that full employment will continue. We believe that full employment provides a new basis for employer-employee relations which will eventually open the way, after a period of transition, to a greater degree of responsible co-operation in industry.

Since the second world war, full employment and widespread social services have eliminated much of the fear of insecurity. Anxiety or fear, partly of insecurity but also of personal insignificance, is probably one of the basic elements underlying the conflict between employers and employees. Its origins go back to the industrial revolution and its impact has not been mitigated in Australia and New Zealand by the arbitration system. Nor has full employment removed the fear of insignificance. The best type of man cannot be bribed by economic security to work wholeheartedly at tasks which appear meaningless; men cannot be expected to co-operate in a system which they believe to be opposed to them. Such attitudes, which militate against conscientious co-operation in the social task of goods-production, have their origins largely outside the factory. It has been fashionable in some intellectual and political circles to overlook the very real material benefits which the capitalist system of industrial production confers not only upon its participants—employees as well as employers—but

also upon the community as a whole. Understanding will require more widespread economic education than prevails at present and the scope of individual employers in this field is limited. But every employer, every manager, every single foreman can do something about recognizing the importance of the work of individual employees and their significance as persons.

Professor Brigden, speaking in 1928 of industrial conditions in Australia, remarked that: "The trade unions have not faced economic realities and the employers as a whole have not faced what I may call human realities." This observation has become of more significance in recent years. Full employment and "the age of inflation" are forcing both parties to re-examine these two realities.

The Individual and the Group

The arbitration system itself has been responsible to some extent for employers' failure to face up to what Professor Brigden called human realities. The system detracts from the status of individuals and tends to reduce them to mere classifications in an award. To treat a man on an individual basis might create a precedent upon which unions would seize to demand from the courts the same privileges for all members of the classification to which that man belonged. The very thought of creating precedents has often been sufficient to stop a factory manager in his tracks and to stifle his arguments in support of what otherwise might be a reasonable and commonsense action. We are consciously attempting to reverse this stultifying attitude and to strengthen the conviction in our factory officers that they themselves are responsible in high degree for the working life of their men, and to strengthen also the conviction that the satisfactions of work are not exclusively a matter of wages and benefits capable of being measured in money. The view that relations between employers and employees are solely economic is destructive of respect and goodwill. It degrades human personality, on both sides.

In evolving policies to meet the new situation brought about by full employment we have a tradition within our own company to draw upon. In the past most of our people experienced a sense of belonging to the company group and identified themselves with it to an extent hardly imaginable in these times. Until just before the first world war, when the first industrial awards affecting our employees came into force, the company dealt directly with its employees. As mentioned in the previous chapter, where I quoted Mr E. W. Knox, it paid wages somewhat above the average and, of great importance in those days,

the employees were substantially assured of continuous work; to a considerable extent they could provide, with the company's help, against sickness, accident and retirement. Relations were good. The company was not backward in saying that it was proud of this situation. The widespread strikes of the 1890s did not affect any of the company's factories. There is no doubt, however, that with the advent of arbitration the administratively easy policy of handing over so much responsibility to the courts, combined with the policies of most unions, tended to undermine the old group feelings and to change them to feelings of opposed interest. Employees came to believe that rising living standards were to be attributed almost solely to the activities of their unions or to the decisions of arbitration courts, and were not linked with productivity. The fundamental association of higher living standards with more capital tools, and therefore with an increasing total volume of rewards for capital, has been obscured.

But despite the diminution in recent decades of the group feeling under the impact of the arbitration system and highly-organized unionism—a diminution which we did something to counter but not as much as possibly we could have done—a similar but less intense attitude still holds fairly widely through most of our factories. We are trying to encourage this group sentiment and to develop it on foundations of real understanding of the worth of the task in which management and wage-earning employees are engaged, together with the shareholders. I think there is evidence that some union leaders are becoming more aware of Professor Brigden's "economic realities". I hope employers appreciate the moral reasons for and real advantages of facing up to "human realities".

In order to encourage the development of mutually responsible attitudes we deal directly with our employees on as many matters as we can. And we are seeking more opportunities for direct negotiations with unions, commencing with matters that have some area where interests are mutual, an area which we attempt to expand.

We realize that working conditions in parts of our older factories are not as good as they could be,and we have been taking the initiative in introducing improvements in on-the-job conditions and in amenities. New dining rooms, change-rooms and showers at many of our factories have been genuinely appreciated by employees and it is satisfying to see the interest they take in keeping them in good order.

We take the view that skill, conscientiousness and responsibility merit recognition. Over recent years we have given special marginal increases in wages to some of our more skilled specialists and leading hands. We have also introduced various forms of payments based on

production or merit, designed to encourage both management and wage earners to become more aware of their abilities and responsibilities in production.

We have increased the numbers and status of supervisors, thus providing more opportunities for advancement and recognition and at the same time assisting to raise standards of discipline, training and communications in our factories. Men intended for more responsible supervisory functions are given special training within the organization.

We are paying still more regard to the training and supervision of operatives and are trying to devise effective means of passing information about their work to factory employees; thus, we hope, assisting them to appreciate their own significance and the significance of their work. At several of our larger factories we have specialist officers to assist management in the engagement and training of employees. We keep ourselves informed of and employ many personnel practices and techniques, but we take the view that the development of men and relations with them are a direct responsibility of factory managers and officers in charge of production and only in particular respects can these matters be handed over to specialists.

In short, we are tending to emphasize the importance of human factors in our factories and seeking to recognize and discharge those responsibilities which are properly ours. Whatever the system by which the community decides to regulate employer-employee relations, the quality and tone of these relations will be decided largely by the degree of respect between managers, supervisors and operatives and by the mutual realization of the size and importance of the field of common objectives. I would stress that in our thinking on these matters we are primarily concerned to avoid reliance on a system which means abrogation of personal responsibility—on both sides.

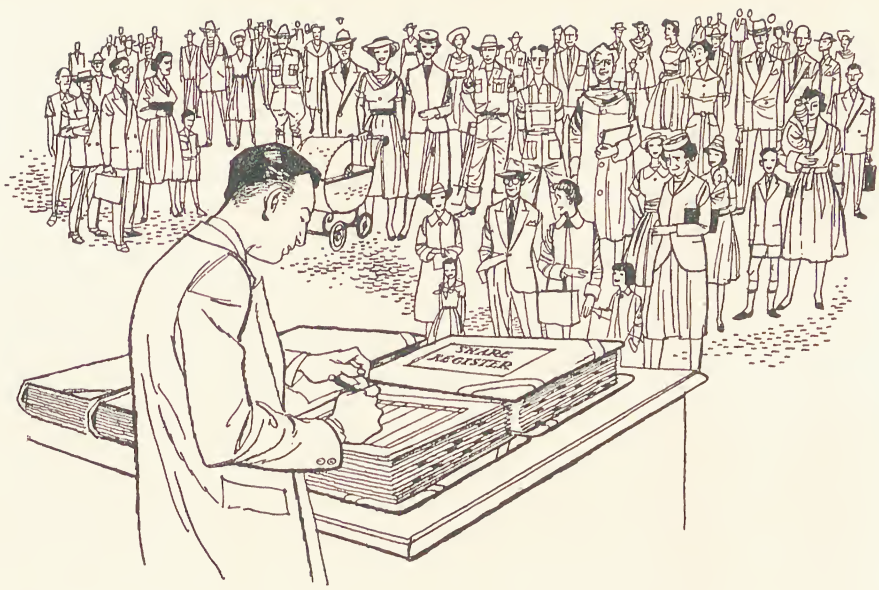
Industrial Relations in Fiji

C.S.R. is proud of its achievements in Fiji and of the way in which its policies and practices have helped the Fijians and Indians to develop and make progress. In this, relations between employer and employee play an important part. It is not necessary to make more than brief reference to that subject in this chapter, however, because it has been dealt with in the chapter on Fiji.

Wages and conditions of Indian and Fijian employees are determined at a conference between the company's managers and representatives from the employees' unions. There is no arbitration court in Fiji such as we have in Australia and New Zealand. There is, however,

provision in the laws of Fiji whereby industrial matters in dispute can be referred to a tribunal set up by the government for the occasion.

We encourage the sugar workers' union, the Chini Mazdur Sangh, to deal directly with us. The representatives of the union and our managers, led by our senior manager in Fiji, now meet annually in conference to discuss and settle among themselves wages and conditions of work. There is no third party present and the parties confer freely, genuinely aiming to reach agreement. And, since the conference method started in 1945, agreement has always been reached without recourse to special government arbitration tribunals. Moreover, what is as important, the agreements have always been honoured. "Reaching agreement by negotiation may at times be a protracted and difficult matter," Sir Ronald Garvey, the Governor of Fiji, said in his opening address to the Fiji Legislative Council in November 1955, "but a negotiated settlement is the most satisfactory settlement of all to everyone concerned because it leaves no bitterness behind it."



CHAPTER 14

The Diverse Ownership of C.S.R.

CLIVE TURNBULL

The critics of our social and economic system have created their own folk-lore about its operation. This folk-lore has exerted a considerable influence and is still a fundamental ingredient in many political speeches and in some arguments before industrial courts. Part of the story runs briefly as follows: "Big companies are largely owned and controlled by small groups of capitalists, with overseas financial interests wielding a sinister influence in the background. These capitalists, having inherited or acquired by dubious means their majority shareholdings, dominate company policy to the detriment of the remaining shareholders and the community generally. The employees have been given no opportunity to participate in the wealth they create."

Whether this legend applies to C.S.R. can now be assessed in the light of the detailed statistical analysis on which this chapter is based. Mr Clive Turnbull has turned a mass of statistics into an interesting, factual chapter which suggests that the folk-lore has been wrong, at least in this case.

December 1955

WHO owns the Colonial Sugar Refining Company Limited? The answer is more than 11,000 men and women, personally recorded as shareholders, plus more than 4,000 who are joint holders and beneficiaries of trusts plus, indirectly, many thousands more who are members of provident funds and other organizations which derive income from C.S.R.—one such association alone has a membership of 10,000.

The vast majority of these men and women are Australians and New Zealanders. Some are well-to-do, some are on the lower income levels, and most are "average". Their occupations are as varied as their two countries. A picture of the shareholder-owners of C.S.R. is a picture of the Australian and New Zealand people—heads of businesses and trade unionists, soldiers and teachers, minors who have yet to take their place in the community life and old people who have served their country and are now living in retirement. There is no uniformity in this pattern other than that all these people have a stake in the company and a stake in their country. But no individual or group of individuals and no outside financial interests control the company, nor can they control it. Control abides in the community of shareholders, a community which is a cross-section of the two nations. There are thus three especial points about C.S.R.—it is, and always has been, owned in Australia and New Zealand; its ownership and control are diffused throughout the community; and it cannot be dominated by external interests of any kind whatever.

For the purposes of this book shareholdings in C.S.R. as at May 1954 were examined in detail from many viewpoints. These examinations were productive of much valuable material. They reveal, as was their prime intention, the essential structure of the company's ownership. But, incidentally, they reveal much that is significant about the investing habits of the Australian public; and, beyond this, they show how such great publicly-owned corporations as C.S.R. have developed from what may once have been highly personalized or "family" concerns to a stage at which they are integral parts of the national economy, with a shareholders' list which is indistinguishable from a "sample" of all but the most unfortunate or feckless sections of the community. Such companies as this have become as much a part of an Australian and New Zealand way of life as our citizen-state relation itself. The needs of growing countries are casting the forms of government and the forms of industry in the same mould, and with the same electorates.

It will be useful to make a brief general survey of the shareholding position before proceeding to a detailed breakdown, a fascinating study in itself. Of 12,471 holdings of C.S.R. shares 4,654 are owned

by individual men, 6,070 by individual women and 304 by husbands and wives. Trustee companies have 50 holdings, persons in conjunction with trustee companies 369, other joint holders 1,018 and the C.S.R. Employees' Provident Fund 6. All these categories, of course, also resolve themselves into individual men and women—an aspect which will be considered later.

Reflecting the general pattern of such societies as our own, the numerically predominant group of women holds the largest group total of shares. Husbands and wives jointly, individual men and individual women hold a little more than half the shares of the company. The Employees' Provident Fund, with 8.24 per cent of the total shareholding, is the largest "single" shareholder in the company, as is shown in the following table:

OWNERSHIP OF C.S.R. SHAREHOLDINGS

Category of Shareholder	*Number of Holdings*	*Number of Shares Held*	*% of Total Shares*	*Average Number of Shares Held*
Individual men ...	*4,654*	*163,617*	*23.31*	*35.2*
Individual women	*6,070*	*187,506*	*26.71*	*30.9*
Husbands and wives	*304*	*8,155*	*1.16*	*26.8*
Trustee companies	*50*	*72,801*	*10.37*	
Persons in conjunction with trustee companies ...	*369*	*79,310*	*11.30*	*214.9*
Other joint holders	*1,018*	*132,759*	*18.91*	*130.4*
Employees' Provident Fund	*6*	*57,852*	*8.24*	
	12,471	*702,000*	*100.00*	

It must be remembered that behind the trustee companies, as the nominal shareholders, stand still further individual men and women. Thus one trustee company has six holdings totalling 30,414 shares, plus 201 holdings totalling 54,945 shares held jointly by individuals and the company. A recent analysis shows that the persons and institutions benefiting from income from the C.S.R. shareholdings held in trust by this particular company include 775 women, 258 men, and 85 minors—in all 1,118 individuals—and numerous institutions such as a university, churches, hospitals, and charitable organizations.

To gain some idea of the spread of shareholdings through trusts, four trustee companies in New South Wales with large holdings were approached and supplied information on the lines of that quoted above. Twenty-two trustee companies, in their own names and in

conjunction with other persons, last year held 152,111 shares in 419 holdings. From an analysis of the details supplied by the four companies the following figures for the 22 companies were reached by extrapolation:

INDIVIDUALS DERIVING INCOME FROM TRUSTEE COMPANY HOLDINGS OF C.S.R. SHARES

Number of holdings: 419		*Number of shares: 152,111*
Women beneficiaries		*1,660*
Men	,,	*547*
Minors	,,	*130*
	Total individuals	*2,337*

All these men, women and children, therefore, must be taken into account with the individual men and women shareholders already recorded.

A similar examination was made of the 1,018 joint holdings. It was calculated that 1,843 individuals were deriving benefit, other beneficiaries including professional associations with a total of 12,500 members, school associations with 4,670 members, provident and superannuation funds and other large groups. The C.S.R. Employees' Provident Fund is a similar group, with 1,596 beneficial members. All these must be considered in the overall picture. If the total is confined to individuals the following picture emerges:

INDIVIDUALS DERIVING INCOME FROM C.S.R. SHARES

Individual men	*4,654*
Individual women	*6,070*
Husbands and wives	*608*
Other men (trusts)	*547*[1]
Other women (trusts)	*1,660*[1]
Minors (trusts)	*130*[1]
Other joint holders	*1,843*[1]
Total individuals	*15,512*[2]

Where do the shareholders live? Of the total of 12,471 holdings in C.S.R. 9,625 or 77.2 per cent (representing 85.8 per cent of the

[1] By extrapolation.

[2] The extent to which individuals holding C.S.R. shares act as private trustees for more than one beneficial owner was not established during the survey of shareholdings. The ultimate beneficial ownership of the company's shares is therefore probably more widespread than is indicated in the above table.

shares) are in Australia and 20.9 per cent (11.0 per cent of shares) in New Zealand, where the company has operated for many years. The percentage of holdings in the United Kingdom is only 1.3 (2.8 per cent of shares). Holdings elsewhere are fractional—0.1 per cent of holdings are held in foreign countries, for instance (see Appendix 29). Even the small holding of shares in the United Kingdom is largely in the hands of Australians who have gone there to live. The directors of C.S.R. have always been desirous that any stock in the company should be acquired only by people living within its sphere of operations—that is, Australia and its Territories, New Zealand and Fiji. Ownership of the company is and always has been predominantly Australian and it is intended that it shall remain so.

Further examination of the shareholdings shows that the greatest number of individual shareholders is in the group owning from six to twenty shares. Thus:

SIZE OF C.S.R. SHAREHOLDINGS

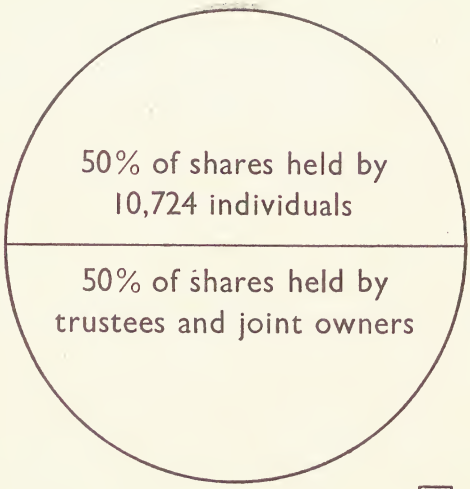
	Number of Holdings		
	5 Shares or fewer	*6 to 20 Shares*	*21 Shares and over*
Individual men	*980*	*2,107*	*1,567*
Individual women	*1,292*	*2,782*	*1,996*
Husbands and wives	*62*	*142*	*100*
Trustee companies	...	*6*	*44*
Persons in conjunction with trustee companies	*12*	*98*	*259*
Other joint holders	*120*	*318*	*580*
Employees' Provident Fund ...	...	...	*6*
	2,466	*5,453*	*4,552*

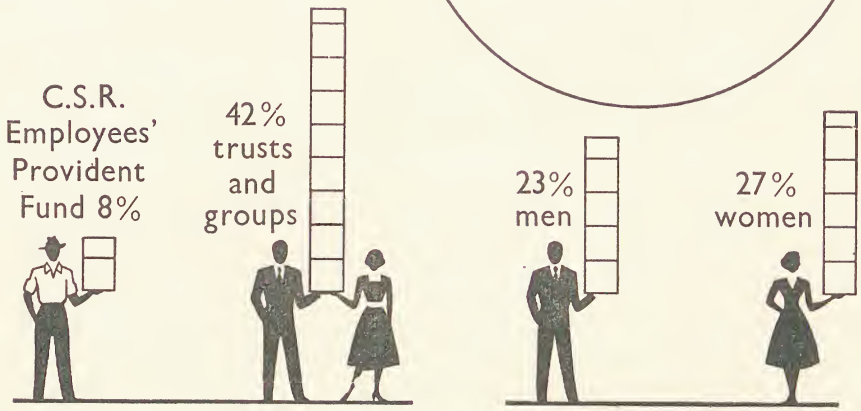
C.S.R. is, above all, a company of small shareholders with whom control abides and it is specifically provided that it shall be so. The company is constitutionally safeguarded against minority control either by individuals or by outside companies. Article 73 of the Articles of Association reads:

> Upon every poll the right of members to vote shall be regulated as follows, that is to say every holder of five (or a less number of) shares shall have one vote and every holder of more than five shares shall have one vote for every five shares held by him but no shareholder shall have more than 200 votes.

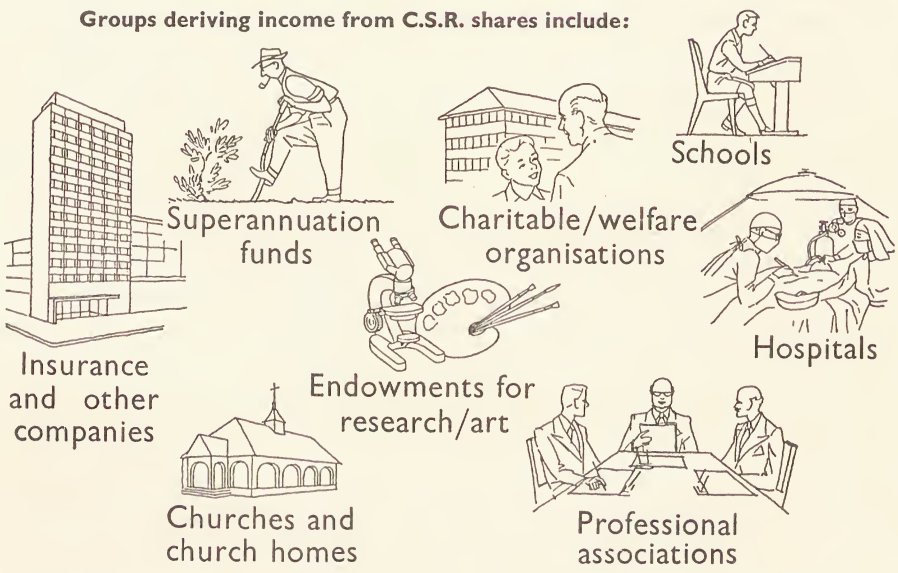
OWNERSHIP OF C.S.R. — 1954

Ownership of C.S.R. is diverse . . . its benefits are widespread throughout the community.





Groups deriving income from C.S.R. shares include:



Analysis of individual shareholdings in the company shows:

DISTRIBUTION OF SHAREHOLDINGS BY SIZE

	Number of Holdings		
	Individual Men	*Individual Women*	*Total*
3,000 shares and over	*Nil*	*Nil*	*Nil*
1,000 to 2,999 shares	*10*	*5*	*15*
100 to 999 ,,	*349*	*373*	*722*
21 to 99 ,,	*1,208*	*1,618*	*2,826*
6 to 20 ,,	*2,107*	*2,782*	*4,889*
5 shares or less	*980*	*1,292*	*2,272*
	4,654	*6,070*	*10,724*

There are 267 holdings of one share only.

Mis-statements made from time to time about the individual ownership of shares in the company appear to be based upon misapprehensions. Thus the Employees' Provident Fund of the company is also the company's largest shareholder. The chairman of the company, Sir Edward Knox, is a trustee for the Fund and the Fund's holdings are registered in his name as one of several joint trustees; Sir Edward's apparent holdings are greatly inflated for this reason. It has always been the policy of the company that holdings shall be, as it were, personalized. The Articles provide that no company, other than a trustee company, shall be entered as a shareholder under its corporate name; and even trustee companies are subject to certain limitations.

As the largest individual shareholder the Provident Fund merits attention. Established in 1890 to provide life assurance during employment, and in decreasing degree for up to ten years after employment, and pensions upon retirement, it holds 57,852 shares in the company with a current market value in excess of £2 million, representing about one-third of the present value of all the assets of the Fund. An establishment entirely separate from the company, the Fund is under the control of trustees consisting of one of the directors of the company, the general manager, two salaried officers, and two foremen in receipt of weekly wages.

The Fund's holding of the company's shares is therefore a matter of

great interest to all its members, who include all permanent salaried officers. As their prospective pensions are in considerable degree dependent upon the current and future business success of the company's enterprises, there is a strong element of incentive. This large holding of company shares by employees is, in its fashion, a form of profit-sharing.

We have seen the manner in which the company's shares are distributed and where they are held. What kind of men and women hold these shares? What is their background? What do they do? For the purpose of this survey the occupations of shareholders have been itemized in detail and also totalled in broad categories. The analysis into broad occupational categories of individual men shareholders in C.S.R. is shown on the next page, together with an analysis of the status of the women shareholders.

Many of these categories are clearly defined—those of doctors and engineers, for instance. In others such sharp definition is not possible—as between "company directors", "business proprietors and entrepreneurs", and "merchants and manufacturers", for instance—but the general purpose is achieved. Leaving aside the large miscellaneous group of "people of various occupations" it will be seen that the largest total shareholding is by farmers and primary producers—both the greatest number of holdings and the greatest number of shares. The second largest group is made up of doctors—441 averaging 36.9 shares each. There are almost as many managers and company officers, though they hold fewer shares. There are large groups of lawyers and other professional men, 75 people classified as "artisans and tradesmen", averaging 16.4 shares each and, of course, a considerable category of retired people.

A more detailed analysis of occupations of shareholders is given in Appendix 30. In this analysis the statistics begin to take on human form and a picture fascinating in its variety emerges. The accountants, agents and architects are, as is to be expected, all more or less familiar examples of people pursuing these occupations. The artisans and tradesmen represent all kinds of constructive enterprise. They include a bacon curer, two dental mechanics, a piano tuner, a pipe fitter, five plumbers, five radio technicians, a watchmaker and seven wool classers. The "business proprietors and entrepreneurs" are no less wide-ranging. Here are an advertising specialist and an art dealer, a billiard-room proprietor and fourteen builders, two chiropodists and three confectioners, one herbalist and twenty hotel-keepers or -owners, one funeral director, one newspaper proprietor, twenty-four storekeepers and five warehousemen.

OCCUPATIONAL GROUPING OF INDIVIDUAL MEN HOLDING C.S.R. SHARES

Occupation of Individual Men Shareholders (As stated at time of first acquiring shares)	*Number of Holdings*	*Total Number of Shares Held*	*Average Number of Shares Held*
Accountants	172	4,060	23.6
Agents, brokers and salesmen	203	5,950	29.3
Architects	31	1,146	37.0
Artisans and tradesmen	75	1,232	16.4
Business proprietors and entrepreneurs	240	7,273	30.3
Company directors	277	10,397	37.5
Dentists	58	1,685	29.1
Doctors	441	16,254	36.9
Educationists and writers	79	2,615	33.1
Engineers	220	7,268	33.0
Farmers and primary producers	582	22,227	38.2
Managers and company officers	440	10,983	25.0
Members of the armed services	99	4,967	50.2
Members of the legal profession	243	9,036	37.2
Merchants and manufacturers	168	9,707	57.8
People of various occupations	837	31,429	37.5
Public servants	92	3,348	36.4
Retired persons	397	14,040	35.4
	4,654	163,617	35.2

STATUS OF INDIVIDUAL WOMEN HOLDING C.S.R. SHARES

Status of Individual Women Shareholders	*Number of Holdings*	*Total Number of Shares Held*	*Average Number of Shares Held*
Married women	3,150	87,498	27.8
Spinsters	1,943	59,556	30.7
Widows	940	38,670	41.1
Divorcees	37	1,782	48.2
	6,070	187,506	30.9

Among "educationists and writers" are found two authors, six headmasters, fifteen journalists, thirty-seven schoolteachers and fifteen people connected with universities. "Farmers and primary producers" include 306 graziers, one bee farmer, one rice farmer, one tea planter and 178 just plain farmers. "Managers and company officers" represent a wide range of industry from airways to wholesale buying. Among members of the armed services, army men predominate. Members of the legal profession include 52 barristers and 166 solicitors. The "merchants and manufacturers" deal in everything from gems to hides and skins.

It is in the category of "people of various occupations", however, where the real poetry of diversity becomes obvious. The lists of these shareholders take on a rhythm of their own:

3 actors
4 airline pilots
2 airmen
3 analysts
5 artists
1 art student
3 barmen
1 baron
1 biologist
1 boatbuilder
4 brewers
1 brewery employee

Or, if we skip down the list: 211 clerks; 1 doctor of science; 1 gatekeeper; 4 gentlemen; 11 jackeroos; 1 librarian; 2 priests; 1 professional cricketer; 1 seaman; 57 students; 11 surveyors; 1 tennis coach; 1 waterside worker; 23 woolbuyers; 1 Y.M.C.A. leader.

"Public servants" include one guard, three health inspectors and three members of the diplomatic service. The 397 retired persons are, as is to be expected, a reflection of the other categories.

There is a pleasant diversity about these lists, in keeping with the nature of society in Australia and New Zealand. It is profitable to reflect that a bee farmer who looks up from his hives to the aircraft pilot flying overhead, a physician and a schoolteacher consulting him may all be shareholders in C.S.R. It is they who are the owners of the business. It is their money which helped develop a great national industry which provides employment and support for many thousands of people. They bear little resemblance to the mysterious and all-powerful capitalists of the political cartoonist; if they are unrecognized it is because they are ordinary men and women going about their daily occupations.

Shares of the company are £20 units. The retention of this high unit value at a time when a number of companies have converted their shares to 5*s* stock units is part of the traditional policy of C.S.R. that its shares should be regarded as investments and not as speculations.

The ownership of the company year by year becomes more widespread, with the £14,040,000 of paid-up capital distributed between an ever greater number of men, women and children. This is due partly to sales, but to a far greater extent to the breaking-up of family holdings.

Inquiry shows that C.S.R. shares are among the first suggested by stock brokers determining the solid, long-term basis of their clients' portfolios. In making such suggestions they are giving advice upon which, in many cases, they themselves have already acted—the company's shareholders include 56 stock and share brokers. "Long-term" investment in the company's shares means, more often than not, life-long. The shares are bought to "put away" and sometimes pass from generation to generation. This is the way the company has always wished it to be and why it has never broken down the £20 share units to smaller denominations—indeed even the £20 is a concession for until 1887 the shares were in £50 units. The company discourages speculation in its shares; it wishes them to be regarded—as they are regarded—as investments in the true sense of the word. Freedom from irrelevant change and market hysteria is particularly important to those individuals and institutions who, over many years, have come to put their trust in the company as an organization

WHERE C.S.R. SHARES HELD

Australia, New Zealand and Fiji

97%

United Kingdom and other British countries **2.9%**

Foreign countries **.1%**

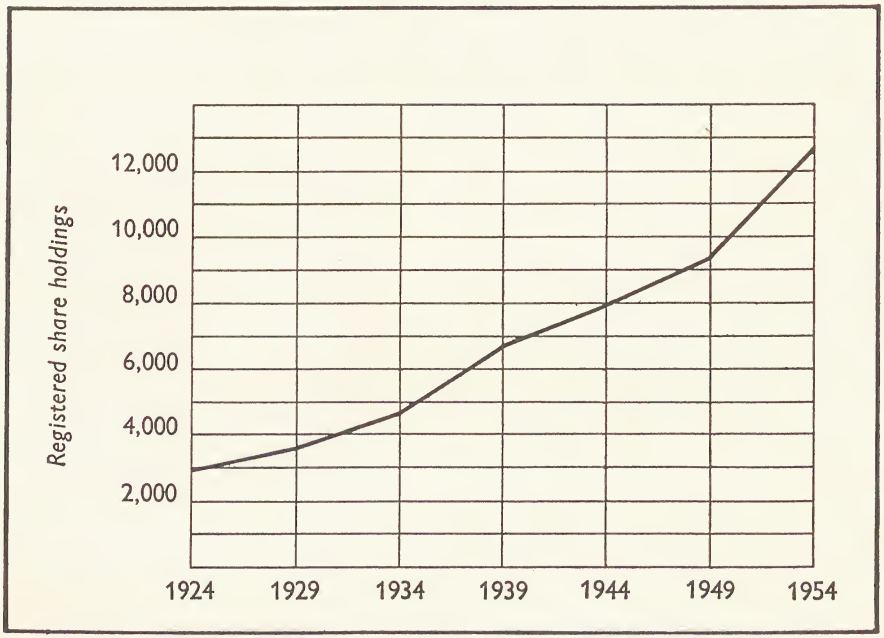
Source: Analysis of C.S.R. share holdings as at May 1954.

whose shareholders' return is derived from manufacturing and merchandising and not from stockmarket operations.

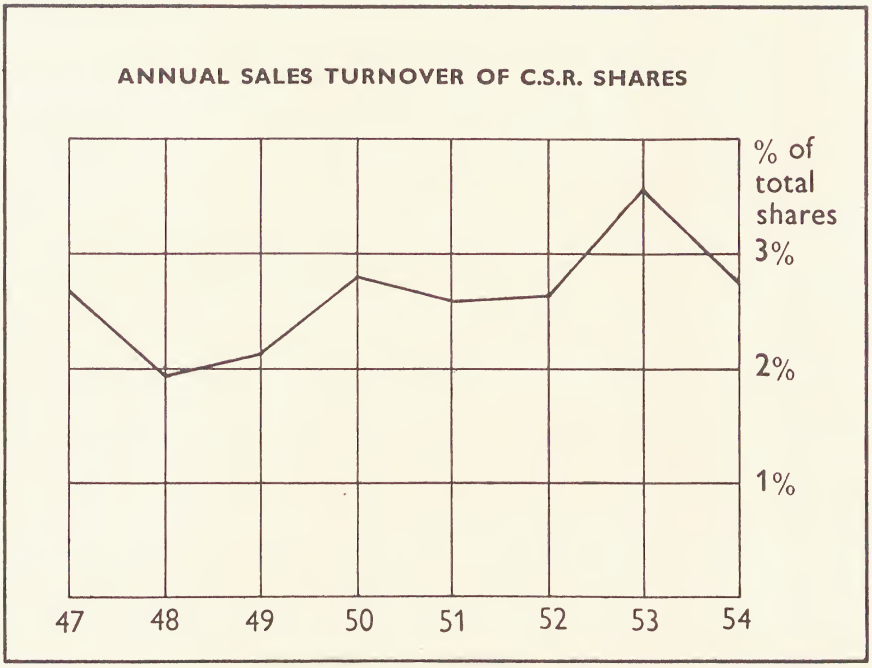
The trend toward the diverse ownership of C.S.R. was remarked upon nearly fifty years ago when (in 1906) it was pointed out that of 1,300 shareholdings (including the Employees' Provident Fund which represented 1,430 people) only 65 were "so-called capitalists". By 1910 there were 1,740 shareholdings, by 1924 2,966, by 1934 4,666, and by 1944 7,982. In May 1954, as has been seen, there were 12,471 holdings, many of them shared by large numbers of beneficiaries not directly recorded by the company.

C.S.R., as an organ of property-owning democracy, is a pointer to the development of society in Australia and New Zealand. It is not the purpose of this chapter to expatiate upon this development. Nevertheless those who give attention to the affairs of the company will not find them the less interesting for the fact that not only industrially, but socially and economically, they are bound in with the future of the South Pacific.

INCREASES IN NUMBER OF C.S.R SHAREHOLDINGS 1924-1954



Increases in the number of holdings result mainly from the breaking-up of family estates. Transmissions account for a much larger proportion of the annual increase in holdings than do sales. Less than 4 per cent of C.S.R shares are sold annually.



There is little trading in C.S.R. shares, which tend to be regarded as long term investments rather than short term speculations. Less than 4 per cent of C.S.R. shares are sold annually. Such sales contribute towards the continual increase in number of share holdings, which have grown from 3,000 thirty years ago to over 13,000 today.

CHAPTER 15

The Rewards of Enterprise

I. C.S.R. 1887-1955—INNOVATION AND GROWTH

II. CORPORATE CAPITALISM IN A MIXED ECONOMY

III. CONCLUSION

J. M. DIXON

Having related how C.S.R.'s activities have grown and how it functions today, this concluding chapter is a description of the main policies which have guided its directors and management, and an account of the rewards received by the shareholders and the corporation's role in the community. The theme of the chapter is rewards—for C.S.R.'s proprietors and for the community.

The first part of the chapter deals particularly with financial policy and economic growth since C.S.R. was incorporated as a limited liability company in 1887. Some of these matters which were dealt with in passing in Chapter 2, The Historical Background, *are now described more fully. It is against the background of rewards that C.S.R.'s pioneering work in the development of large-scale production and application of science to production is seen most strikingly.*

The second part of the chapter, Corporate Capitalism in a Mixed Economy, *considers the problems which confront both the corporation and the community in ensuring material progress, gaining higher productivity, preserving freedom and achieving other social objectives. These issues are considered in relation to the far-reaching and rapid developments which have been taking place in social evolution. This part of the chapter could have been treated as a separate essay, but it has been included here because the issues raised are so vital to the ability of corporate enterprise to contribute its best in rewards both for shareholders and for the community. Some of the more detailed and technical argument in relation to such matters as inflation, high taxation and government controls has been dealt with in supplementary notes.*

The concluding part of the chapter gives in concrete terms a very brief summary of the contributions of C.S.R. to the societies in which it operates. Some of the non-material contributions are mentioned briefly. The material achievements are summarized finally in a few simply presented and highly significant facts.

Mr J. M. Dixon joined the company in 1932, gained his early experience largely in the commercial and marketing fields, and is now one of the two assistant general managers. He is a graduate in economics of the University of Sydney and a qualified accountant.

July 1956

I

C.S.R. 1887-1955—INNOVATION AND GROWTH

On 1 January 1855 the Colonial Sugar Refining Company was formed as a partnership of ten persons with unlimited liability. The paid-up capital was £150,000. The business was confined to sugar refining, and distilling on a small scale, in Sydney. Within two years a dividend rate of 50 per cent was paid—never to be repeated. The story of the crash and near-bankruptcy that followed has been told in Chapter 2. In it originated the policy of saving and accumulation.

1887-1914

FROM INCORPORATION TO WORLD WAR I

The company was incorporated as a limited liability company, registered under the laws of the Colony of New South Wales, on 1 July 1887. The Statement of Assets and Liabilities of 30 September 1887 shows the assets as: "Pyrmont and Yarraville Refineries"; "Sugar Mills"; "Ocean Steamers"; "Interest in the New Zealand Sugar Company Limited"; stocks, debtors and sundry items. The paid-up capital of the company, at £600,000, put the company amongst the large companies of the day but some way below the largest in capitalization.

At 30 September 1887 the funds used in the business were derived from:

	£
Capital paid up	*600,000*
Reserves and undistributed profits	*356,513*
Shareholders' Debentures	*351,422*
Debentures	*515,000*
Creditors	*385,307*
	£2,208,242

The great depression and the bank crisis of the 1890s were at hand, unknown to the board and the proprietors of 1887. But they knew that they did not possess a "strong balance sheet"—debentures were too high. For the nine months to 31 March 1888 a dividend at the rate of 6⅔ per cent per annum was paid, using only £31,705 out of the profit of £74,062.[1] Thus the first accounts indicated the policy of the new

[1] Tabulations of movements in the company's capital and annual profits are given in Appendix 31.

public company under the leadership of the merchant-banker-industrialist, Edward Knox.

The business was recovering from losses and a severe depression when it was incorporated with limited liability. The losses had been caused by a heavy fall in world sugar prices in 1884. The dividend rates indicate the situation:

1883	.. ..	20 per cent
1884	.. ..	10 „ „
1885	.. ..	Nil
1886	.. ..	5 per cent
1887	.. ..	6⅔ „ „

From 6⅔ per cent in 1888 the dividend rate had risen by 1892 to 10 per cent on share capital which had more than doubled, but with debentures more than halved. There it stayed, apart from a 2½ per cent jubilee bonus, for 20 years until 1911, while paid-up capital increased from £1,438,820 in 1892 to £3,000,000 in 1911; and debentures were further reduced from £348,600 to £61,850. By 1914, at the outbreak of World War I, the dividend rate had risen to 12½ per cent, the paid-up capital stood at £3,250,000 and the last debentures were paid off in that year.

In the 27 years since incorporation there had been an increase in capital of £2,650,000, derived two-thirds from shareholders' direct contributions, including those contributed as assets of amalgamated concerns, and one-third from profit retained in the business.

The period from 1887 to 1914 was a particularly significant one in the financial history of the company, as well as in other respects. During it, and for long afterwards, E. W. Knox was the dominant force and in the record of events we can see the influence of his mind and character, themselves greatly affected by his father's precepts. The main developments of this period were:

Expansion: The business was expanded at an exceptional rate in the context of those times in Australasia, and with boldness and even daring.

Debt Repayment: The unshackling of the business from creditors was made possible partly by the conversion to a public company and partly from its profitable accounts, which facilitated both the reduction of debt out of undistributed profits and the raising of further funds from an increasing range of shareholders to substitute for debenture money. (The partners in the unlimited company prior to 1887 and the public company in its early years

had been forced to raise debenture finance to cope with the expansion.)

Capitalization: The policy was applied of writing down fixed assets heavily—or, rather, of not writing them up—and charging to operating expenses large sums that would nowadays be regarded as capital expenditure.

Staff: A strong staff was built up, for the most part of professional outlook and status, and possessed of *esprit de corps* in high degree.

Manufacture: Great gains were made from reduction of process losses and from the exploitation of mass production methods by the business and production genius of E. W. Knox, who, in Australia, was two generations ahead of his time.

While some of these things were, of course, not unknown in the South Pacific, several of them were new and, in particular, the company was clearly an innovator in their combination. But these five developments within the company gave rise to a sixth external development of considerable consequence:

Political Hostility: C.S.R. entered the twentieth century the largest manufacturing organization in the South Pacific, and because of its unique size and success it became at that time a convenient focus for the attention of newly-developing socialist forces.

Expansion

The development of the business from about 1880 until 1903 was a new phenomenon in the South Pacific, not understood by the new political thought that was coming to the fore in the youthful Australasian democracies. It is described elsewhere but is summarized here in juxtaposition to the financial story. Fourteen sugar mills and refineries were built and two were bought; all the mills were large by the standards of the day. A heavy slump in sugar prices was overcome, then the bank crash and depression of the early nineties; technical control of processes was introduced and developed with remarkable speed; the company was converted to a public company; three amalgamations were effected. From 1880 to 1905 raw sugar production increased from 5,352 tons to 119,343 tons per annum and refined sugar production from 13,550 to 180,230 tons per annum. The scale of increase shown by these figures is in itself a measure of the company's social value, in terms of its contribution of goods for internal con-

sumption or for export to help pay for the imports required by these developing countries.

The increased spread of milling activities—from New South Wales to Queensland and to Fiji—was of great assistance in this period by evening out the effects of fluctuations of seasons and crops, to which raw sugar mills in particular localities remain today especially susceptible.

Removing the Constraints of Borrowed Funds

The directors, led by Edward Knox, H. E. Kater (who followed Edward Knox as chairman from 1900 to 1920) and E. W. Knox (who became a director on the death of his father in 1901) were anxious to get freedom of policy-making and risk-taking. They disliked the restraints on freedom of action caused by such a high proportion of debenture finance, and determined to reduce it gradually. The directors' report in 1899 stated, " . . . you are aware that it has long been the wish of the directors to gradually replace the interest-bearing liabilities with capital provided by the shareholders." And in 1900, "Since 1889 about £1,100,000 has been added to the paid-up capital, and as this has for the most part been applied to the reduction of the interest-bearing liabilities, the company has been put in a strong position in this respect." The greatly reduced debentures then stood at £292,000. All debentures were finally paid off in 1914 and debentures do not re-appear in the balance sheet until 1953.

The risks inherent in the rapid expansion at the end of last century did not greatly worry the directors of the time in relation to shareholders, on whose behalf they were fully prepared to take big risks. But whether such risks were justified while so heavily in debt, because of the legitimate interests of lenders and, doubtless, because of what they might do in a crisis, was a question that worried conscience and hindered action. As long as they were reducing the outside debt and increasing the proprietors' equity in the whole business, however, the Knoxes and the other directors felt justified in pushing on. This is summed up, following numerous references in earlier years, by the remarks of chairman Kater in 1910:

> The former [the substitution of shareholders' capital for borrowed money] has told greatly to our advantage in this way. It is necessary in every business like ours to look forward to the complete replacement of the plant after about twenty years of work, and if, as is so often the case, this has been purchased with money borrowed on debentures or otherwise, there should be set

> aside yearly a sufficient sum to pay the debentures at maturity or to provide new machinery. Now, we have asked you from time to time to pay off all liabilities as they fell due out of capital subscribed by the shareholders, and, in consequence, the large amounts which, under other circumstances, we should have reserved to meet such payments, have been available for new ventures.

If the proprietor, and not creditors, owns the business, he can take risks, including the expenditure of replacement reserves; then replacement falls on him to provide out of earnings held back, subscription of capital from shareholders, or, if he likes, he can try and repeat the process of borrowing and paying off. But first he must clear or greatly reduce his existing debt. That, at any rate, was the policy of the Knoxes and their fellow directors; and in a number of statements they made it clear that the policy was rooted in conscience.

Capitalization

Accountancy had not in those days assumed the dominance it now holds in business affairs, and perhaps something of a loss in the commonsense practical business approach has to be recorded as some offset to the great developments and added precision of modern accountancy, deeply influenced as it has been by the necessity to assess profits according to strict rule for income tax purposes. Accountancy methods and those two new techniques which depend on accountancy—income taxation and price fixing, with their emphasis on historical cost in money terms—have distracted attention from more real values. The Knoxes refused to consider as real assets anything that was not obviously of permanent value, or exchangeable for value. They regarded "value" as the paramount thing—a concept partly submerged in modern times; to them the monetary cost of the assets was an incident that had happened in the past. Land was real enough and so, up to a point, was machinery. But buildings and installation costs were not permanent assets in their eyes because, while they believed in sugar production, they did not necessarily believe in any specific locations for it.

Several times they closed mills and moved the machinery; many more times they contemplated and prepared for such moves. A few examples will help to show the reasons for their views and some of the unusually precarious features of the business. In New South Wales, Southgate Mill was closed and Darkwater was moved from the Macleay River to the Clarence (and renamed Harwood). In 1885 the Queensland Government had passed an Act to bring the immigration of

Kanakas to an end in the early nineties. The alternative to what was considered at the time to be the forlorn hope of producing sufficient cane for the *tropical* mills in Australia without Kanakas for field labour was to move mills to Fiji. It was announced that Victoria Mill would be moved to Fiji.

In 1891 Edward Knox told the shareholders: "The Queensland Government has introduced a bill which will allow the acquisition of properties—such as our plantations—by the neighbouring settlers, and if this measure passes in this or the next session, we expect to dispose in this way of the Victoria Mill at a price which will return to us the sum to which it has been written down, and we have intimated our willingness to accept such an amount."

There were further threats and risks. The New South Wales raw sugar industry had grown up under an old duty on sugar instituted, as chairman Edward Knox said, "many years before anyone knew that sugar could be made in New South Wales, and for revenue purposes only". The Government of the Colony of New South Wales proposed in 1896 to remove this duty and this put the company in an awkward position. The board considered that though the company was a free trader in principle it should point out the facts.[2] These were that without the duty, most of the protective value of which the company was paying over to the growers, the New South Wales industry could not compete; and the company would not condone, support or take part in the employment of Kanakas in New South Wales to reduce costs of production. The board referred to "the losses which we shall necessarily sustain by writing down the plant to its value for removal"; but also said that, while it would be prepared to carry on at a reduced price for cane, such a reduction would probably put the farmers out of business. After some years, the New South Wales Government abandoned its contemplated abolition of the duty. In the same decade, however, gumming disease in cane seriously threatened the existence of the industry in New South Wales and forced a number of non-C.S.R. mills to close.

There were direct political risks too. Nationalization of the refining industry was one of the points considered by the 1912 Royal Commission (which recommended against it mainly on the grounds that the company's refineries were of "high efficiency", and "we do not

[2] This kind of business problem can be compared with the position of a cricketer who considers the "laws" of cricket need amendment; but until they are altered he has to play under the existing laws. It is typical, too, of a range of problems to which companies have to decide their practical approaches, and with increasing frequency today in our "mixed economy". A company may disagree with conditions and policies that the community applies, for instance in tariff or trade matters, but in practice has to work under such conditions.

think that the public ownership of the refineries would prove as financially successful as the present private ownership").

There were thus enough threats and risks to justify the directors' decision to value the plant at its "value for removal". Indeed, they considered that to value it otherwise would be to mislead the shareholders and, even more serious in their eyes, the creditors (i.e., the debenture holders).

As free traders by belief, and actually conducting refining in Australia and New Zealand on a free trade basis (this included the refineries in the several States with the exception of Victoria before Federation), they did not capitalize duties on any plant, practically all of which was imported; nor did they capitalize the ocean freight. The directors made no secret of what they were doing, as has been indicated by some of the quotations given. And there were many similar references; for instance, the address to the "proprietors", as they were generally called, stated in April 1896: " . . . our investments in sugar mills in New South Wales represented an outlay of nearly £550,000, without taking into account large sums paid for duty on plant and for alterations and additions, which we did not think fit to charge to capital account."

In the period of the great expansion the load to operating expenses of charges for freight, duty, buildings and installation work must have been a heavy one, and could only have been sustainable out of high annual returns. These the company was getting, owing to chemical control, mass production methods, increasing quantities made and sold, and expert management.

This process of writing off so much to operating expenses also meant that, when most of the threats had been overcome or had subsided, when consolidation had occurred, when duties were not removed, when most of the ventures proved to be soundly located and when cane diseases were controlled, the real value of the assets (despite several casualties) was much more than the figures at which they stood in the balance sheet. Thus, the directors reported in 1913 " . . . our assets in the Commonwealth stand at less than their cost."

The Administrative and Managerial Staff

As it developed in size the company quickly came to appreciate the importance of a strong administrative staff and a loyal general body of satisfied employees. There are reports to the board in the 1880s that even today make enlightening reading. The facts and records show that the company had the practice as well as the understanding. The

board understood the close link between management and staff, on the one side, and rewards for shareholders, on the other, and wished the shareholders to know it too. On the occasion of the company's jubilee in 1905 the shareholders were told by the chairman that "you will know that it is to that [administrative] staff that all businesses look for their well-being". E. W. Knox spoke on that occasion, as on others, almost in the tone of an Old Testament prophet leading and admonishing his people; he mentioned the above-average remuneration received by the salaried staff and other employees and referred in terms of austere fervour to the effort, spirit and vision the company counted on from the senior staff. On the material side the company was then also strongly developing the Employees' Provident Fund and the separate Employees' Benefit Society, on contributory bases.

Financial Consequences of Chemical Control and Mass Production

The internally-developed methods of chemical control and of mass production in large factories were powerful assets, although they could not appear in the balance sheets. The additional profit benefits they gave the company over its competitors, the extent to which it outdistanced the latter, some by a very great margin, and the long period over which it sustained these advantages made possible the rest of the financial policies.

The concepts were well understood, as shown by E. W. Knox's 1890 address, reprinted as an appendix. Thomas Buckland, chairman in Edward Knox's absence, told the proprietors in 1892: "We keep in view our constantly increasing trade, and the desirability of maintaining our profits by selling more largely at a narrower margin of profit, the larger output reducing the working expenses [per ton], and thus permitting us to accept lower prices."

The annual reports for many years are sprinkled with references to the gains from chemical control and from the reduction of process losses. That great profits could come from this source may be difficult for people who do not know sugar to understand. But it was so, three features of the situation being: the very high proportion of the total cost of the product represented by the sucrose bought as raw material in the cane or raw sugar; the highly unstable nature of sucrose, chemically, physically and microbiologically, when dilute and in process; the difficulty in separating it from several of the chemical "impurities" with which it arrives in the factory.

By 1910 losses of sucrose had been reduced by about half compared with the first full year of chemical control in all the factories in 1885.

The extra sugar so made in the year 1910 was 28,900 tons, worth at then current values £289,000; and E. W. Knox was saying, "there is room for further improvement". The total profit in 1910 was £344,470. The company stated that its assets outside Australia, "worth between £2,000,000 and £3,000,000 had been paid for out of profits", and made it clear that these profits were substantially the fruit of superior technological skill.

Chairman Kater and E. W. Knox both publicly named, as the two secrets of the company's success, the debt-reducing financial policy followed since 1888 and chemical control, and gave the greatest weight to the latter. E. W. Knox was not the man to refer to another factor, key to all the others—his father's and his own great abilities.

Size, Success and Political Hostility

Edward Knox's financial outlook had been hardened into set policy by the sugar market crash and near-bankruptcy of 1858. He seems to have remained in control, at least of broad financial policy, until the end of the century. His life's work was building up business and financial enterprises. To him dividends for the shareholders were subordinate to building, and he left a strong financial structure to benefit his successors and the shareholders of the future.

E. W. Knox was a builder equally great or even greater and his financial policy is hardly distinguishable from his father's. He acknowledged that he had been greatly influenced by tradition, by the family's financial stringency when he was a young man, and by his father's precepts. If tendencies inborn or thus developed needed strengthening they received it. In 1884, four years after E. W. Knox became general manager, the Victoria Sugar Company (half-owned by C.S.R.) lost, through the sugar market crash, £400,000, a tremendous sum for those days and for the scale of the business then—compare it with the £600,000 total paid-up capital of C.S.R. on 30 September 1887, three months after incorporation. C.S.R. was deep "in the red". Soon came the bank crisis of the 1890s. There were threats from climatic and soil deficiencies, from cane diseases, from labour shortages, from duty variations, and from political action. All these things would have convinced a man of E. W. Knox's temperament that his financial structure had to be unassailable. By 1914 it was, and the company was in a position of great all-round strength, financial and otherwise.

Indeed, it had succeeded too well for the temper and educational standards of the time. Its services to Australia, New Zealand and

Fiji had been large and important and, as it had to demonstrate publicly, it had gained its size and strength by exploiting no one.

W. M. Hughes had led a series of attacks upon the company in parliament and press. This criticism and the general situation in the sugar industry of Australia brought about a Royal Commission, which was appointed in October 1911 and made its report in December 1912.

The proceedings of this commission covered all phases of the sugar industry—growing, milling and refining—and are referred to in the historical chapter. Almost without exception witnesses who had experience of the company's business methods, as customers, cane suppliers, competitors or technical experts, spoke of the company in terms of commendation. Of the many such witnesses two can be quoted briefly here. They were independent, knowledgeable and experienced in the industry and their testimony was given under oath and subject to cross-examination.

J. C. Brunnich, chemist in the Queensland Department of Agriculture:

> The whole sugar world should thank the Colonial Sugar Refining Company for the efficient way they started in the early days. They gradually worked the business up and economized in every respect, and their system has gradually spread to the other mills in more or less complete degree.

Charles E. Young, prominent sugar plantation proprietor:

> I wish here to state that the industry owes a debt of gratitude to the Colonial Sugar Refining Company for showing the way to improved machinery. This industry would have been a one-horse industry had it not been for the lead given to us by the Colonial Sugar Refining Company. . . . We are active competitors [of C.S.R.].

The report of the commission said: " . . . in the case of the Colonial Sugar Refining Co., monopolistic control [of the market situation, based on refining][3] is the result, less of the pursuit of 'predatory' methods of certain American Trusts, than of large scale industry and a high efficiency of organisation . . ."

[3] The situation was complicated and quite different from that obtaining now. The company had a major degree of monopoly of refining *vis à vis* other Australian refiners, for the reasons stated by the Royal Commission, but it faced real competition from imported refined. Then, as now, there were many other millers, who as millers were in substantial competition with one another; and some of them, in addition, marketed certain types of raw sugar in competition with one another and with the refiners.

The company, E. W. Knox pointed out to the commission, was in receipt of no public aid, protection or subsidy, and was faced with competition. The rewards won for the proprietors had been won against all comers in an open field of opportunity. Refining in Australia was on a free trade basis[4] and competition from imported refined was keen. Moreover, C.S.R. prices to consumers were shown to be lower than in the United Kingdom when both were expressed on a duty-free basis. In milling in Queensland, where comparisons could be drawn, C.S.R. paid somewhat better prices for cane than government and co-operative mills. The company, as much as or more than anyone else, was responsible for the system of independent farmers and there was a preponderance of successful farmers supplying the company's mills. Wage-earners were paid a little better than current rates, taking all things into account, and, as one of the commissioners said, "everywhere we went, we could not help being struck by the fine type of men the Colonial Sugar Refining Company employed, whether managerial, professional, or mechanical".

Judged by the facts and the details of the arguments, E. W. Knox had in public exchanges regularly worsted W. M. Hughes, careless of his facts but acute in his political sense. But, as one would expect, the overall political result, with such a master as Mr Hughes in the controversy, was not favourable to C.S.R. Mr Knox did not always deign to reply and his infrequent, belated and cold statements and plain facts were without popular appeal. And although the published report of the Royal Commission substantially vindicated the company, it was not the kind of material to make popular reading, and adverse publicity over a period has long-term effects not easily eradicated.

Later, in 1919, the company was asked by another sugar commission to give "the private details of the working of our mills and refineries" but refused "to explain to our competitors all that we have done in this direction". Chairman Kater told the shareholders, "Many allusions have been made in the newspapers of late to the application of science to industry, and you can estimate for yourselves the depth of feeling on this subject by the continuance of the efforts to break up the one business in which some success has been achieved by the adoption of the methods of scientific control."

In the unindustrialized period in the South Pacific preceding World War I, C.S.R. must have looked like a mountain on the industrial landscape. Amongst business organizations only one or two banks

[4] There was a Commonwealth import duty on sugar entering Australia but C.S.R. as refiners passed on the whole of its value to the raw sugar industry in the price paid to the mills for raw sugar; as shown in the evidence to the 1911-1912 Commission.

could compare in financial strength. But the company, pre-eminent in size and success over all other manufacturers, and by now very strong in its organization, its administrative personnel, its technology, its market experience and its finances, was to remain for some time a favourite target for political attack. Its lack of success in this field was an offset to the rewards otherwise accrued to shareholders and might prove their great weakness if it were to continue.

1914-1924

WORLD WAR I AND AFTERMATH

Once a company has achieved a position such as C.S.R. held just prior to World War I, it has a good chance of being able to operate in the future on the basis of self-generated and internally-financed expansion; generally its prospects are excellent. But the dangers are real enough: major economic or technological change; political action; labour supply difficulties; failure to keep the enterprising spirit; failure to remember the lessons learned in the era of development; idolization of the past—"resting on the oars". Some of these occurred and were overcome, after a time, such as the labour shortage in Fiji; others did not happen or were prevented from developing by the company's policies.

There was nothing new in the company's business philosophy, even though in its manufacturing organization there were elements new to the South Pacific. To most people, the general and financial philosophy is, perhaps, best understood and most clearly seen in farming communities. Save some money, buy a farm with as good a rainfall and soil as you can, borrowing half or more of the purchase price. Work hard all your life, live hard in the early days, and save and save. Pay off the debt and repeat the process. Never live up to your income. If markets and seasons are not unkind, by the time you are elderly, and perhaps sooner, you are comfortably off, maybe better than that, and you leave your children in a sound financial position. If they are lazy, or spendthrifts, or dead unlucky, they or their children will be back to shirtsleeves. If they are reasonably hard-working and reasonably thrifty they will have easier lives than you had. If you and your children keep on living below your income, and the income is now good because of past self-denial, you go on progressing and accumulating, subject to market changes, drought, income taxes, resumptions and death duties.

This is one important side of the capitalist method. It presents a fairly close analogy to the development of C.S.R., although the

company was also an innovator, which brought additional gains. It is an apt picture of where the company stood and what its prospects were before the first world war. But big changes, which were to have great effects on the capitalist method of production, were coming to the whole western world. The virtual absence up to that time of income taxation on companies had made the accumulation of capital very much easier than it was to become later. This situation was an important factor in the progress of the company and in the rewards then obtained for its owners. There was no governmental "sleeping partner" to claim a high share of profits as soon as they were made. Prior to World War I, there was no company tax raised in Fiji or by the Federal Government in Australia and the tax rate in the Australian States and in New Zealand varied from 6*d* to 1*s* 0*d* in the £.

C.S.R. in Australia, 1914-1924

In 1915 the business outside Australia was turned into what was in most respects a subsidiary company, the "Colonial Sugar Refining Company (Fiji and New Zealand) Limited", which remained under the control of and was operated by the board, management and staff of the original company. C.S.R. owned the ordinary shares but practically all the issued capital was in the form of 6 per cent preference shares issued free to C.S.R. shareholders individually, who thus, if they did not sell the shares, received profits from the ex-Australian activities directly.

The parent company's dividend was practically halved (from 12½ per cent to 6½ per cent), thus confirming the situation as stated before the war, namely that about half the total profits were coming from the £2,000,000 to £3,000,000 of assets in Fiji and New Zealand. These assets, as the directors had repeatedly said, had been created mainly out of saved-up profits, combined with what would now be termed depreciation and replacement reserves. The level of retained profits continued high enough for replacement of buildings and plant, when it became necessary, to be self-financed.

In 1915, under wartime arrangements, the Australian company started refining on contract to the Federal Government and henceforth, unsought by C.S.R., profits from refining were insulated from the competition of refined sugar from abroad and were to be affected mainly by the less marked variations in the quantity refined and sold. This moved slowly but steadily upwards with population increases.

The Australian mills were affected during the war by lower production and the control of raw sugar prices at a low level. But in 1920

the mills in the Queensland industry generally considered that they were being unfairly treated and made strong representations. The Commonwealth Government "jumped up" the price of raw sugar from £21 to £30 6*s* 8*d*, partly to help rehabilitate the milling side of the Australian industry. With good seasons and this price fillip, C.S.R.'s Australian mills did well. The price was reduced in 1923, but not very heavily. It was at this time that the sugar marketing pool was formed in much its present shape under the control of the Queensland Government, with refining and some other matters contracted out to C.S.R. and the Millaquin Sugar Company.

Through the war profits had remained stable, as had dividends at 6½ per cent, while reserves increased moderately. In 1919 chairman Kater said: "It is time the shareholder should be remembered; the salaried men have had bonuses during the war, the wage-earners higher pay, and the farmers more for their cane; but since the war began, the owners of the business have had nothing extra."

In 1920 a bonus dividend was paid, because "the higher prices now being received for our [Australian] raw sugars justify the addition to your income". From then on there are several statements about the satisfactory results obtained from the Australian mills.

By 1923 the profit from the Australian activities alone was, in terms of money, nearly back to the prewar level from Australia, Fiji and New Zealand, although in value only some two-thirds of prewar because of the fall in the value of the £. There had been increasing volume of business at the unchanged margin per ton on refining, but the postwar elevation of raw sugar prices, which favoured the mills, was the most helpful factor inside Australia.

The Fiji and New Zealand Company

In Fiji, during the 1914-24 period, C.S.R. enjoyed the most spectacular monetary success in its history. The world sugar price rose each year from £10 9*s* 0*d* a ton average for 1913 to £65 14*s* 0*d* in 1920, with peak prices of £80, and in isolated instances even more. The mills in Fiji obtained the benefit of the rise in the market and a lot of money was made. The company in Fiji sold to New Zealand, at less than market price, enough raw sugar to keep that country supplied; New Zealand consumers received the benefit and the company was thanked by the New Zealand Government. The benefit to the company of the high sugar prices would have been much greater if the ending of the Indian indentured labour system had not reduced the production level in Fiji before 1920, the year of extraordinarily

high prices; the labour shortage, however, had its worst effects after 1920. The Fiji and New Zealand company retained most of the good profits, paying its 6 per cent preference dividend to the rank and file of shareholders and a low dividend on the small ordinary capital held by the main company. Prices and production both fell after 1920.

The ex-Australian company, starting with assets of £3,500,000 from the parent company, and after paying low dividends and conserving profits, terminated its separate existence in 1923. Almost entirely out of the operations in Fiji, it then:

> Paid off the individual preference shareholders with a premium of £203,000.
>
> Repaid the ordinary capital to the parent company.
>
> Paid the shareholders of the parent company £325,000 in cash, and paid £650,000 to the parent company on their behalf to restore the paid-up amount of their shares from £16 to £20 each. (£4 per share had been returned to shareholders in 1920.)
>
> Returned the balance of its assets to the parent company.

Shareholders in the parent company then received a share issue of £1,625,000 (1 for 2) as the counterpart of the assets received back from the subsidiary.

The Fiji fixed assets were taken back into the parent company's books at the low figure of £1,139,000. The board considered the low valuation of assets was necessary because, despite the spectacular business success in Fiji in the recent past, the industry there was at that time threatened with extinction by the ending of the indentured labour system. Sugar production in Fiji had fallen in two years to about half its previous level and the market price had also fallen very heavily. The serious threats to the business in Fiji were, however, ultimately to be conquered by initiative and resource—the installation and development by the company of the unique Indian small farm system.

The results from Fiji had been exceptional, especially in the 1920 bonanza of very high world market prices. A recent analogous situation is the profitability of wool in Australia, especially in 1950-51, and its subsequent decline in value. In both cases, world markets were responsible. They form a risky basis for operations, at times cruel but occasionally very fruitful. And C.S.R. in Fiji had no company tax to pay until 1921. Of the gains made in Fiji, some were distributed and some retained in the parent company.

With the issue in 1915 of the preference capital in the Fiji and New

Zealand company, combined with the termination of that company's existence in 1923, had come the first major release to the proprietors of the savings of the great builders and conservers, after nearly 70 years of operations. Until then the releases of saved-up profits had been small and piecemeal. But the world raw sugar market in 1924, although momentarily brighter, was in reality sick and, although E. W. Knox had loosened the purse strings, this man in these circumstances could be counted upon not to let them go.

Shareholders' Position in 1925

When the company's affairs had settled down after World War I, the comparison with the prewar position for shareholders was as follows:

	Years ended:	
	31 March 1914	*31 March 1925*
	£	£
Paid-up Capital	*3,250,000*	*4,875,000*
Profit for Year	*519,201*	*760,653*
Dividend Amount	*406,250*	*548,437*
Dividend Rate	*12½ per cent*	*11¼ per cent*

These seeming improvements for the owners had come from their past savings and otherwise mainly from the mills, and more from the mills outside Australia than those in it. Superior technical efficiency had continued to play its part. Over the 11 years from 1914 to 1925 production of raw and refined sugar (in tons, not in value) had increased by 25 per cent. The value of money had fallen in Australia some 50 per cent. These two facts, taken in conjunction with the financial tabulation, show that at that point the shareholders had lost ground *as to their annual income from the company*, the purchasing power of profits and dividends having declined. This was the more marked when compared with the increased productive contribution their company was making to the community. Gains had been made, however, which are not shown by the above tabulation: the owners had received a large distribution from savings accumulated over a very long period—almost since the company first ventured outside Australia—and greatly augmented by a windfall financial crop in Fiji. Also profits were soon to improve and a further distribution of accumulated savings was made in the form of a share issue of £975,000 in 1927.

Relations with Governments in Australia

This war and postwar period had another effect on the company which was ultimately fruitful in consolidating the interests of shareholders. A start was made in this period, fortuitous and not by design, in mitigating the suspicion in which the company had been held politically. The company had always carefully avoided politics and political contacts, irrespective of party. It did not fundamentally change this outlook or practice, but circumstances forced it to work with and for governments. It managed and operated the wartime sugar supplies for the Commonwealth, and W. M. Hughes and E. W. Knox came to know and respect one another. Senior men on both sides came into close contact. In 1923 a similar relation commenced and has continued ever since with the Queensland Government. The company began to learn how to work with governments in business, while eschewing politics and party politics; and responsible persons of every political interest began to understand something more of the corporate capitalist system and method of production, at least as represented by C.S.R.

1925-1955

THE LAST THIRTY YEARS

E. W. Knox resigned early in 1933 and died a few months later. In his last years he made occasional observations that showed the nature of his financial thinking, which largely dominated the company's policy.

In 1927 the Adelaide refinery was rebuilt after being half-destroyed by fire. Said E. W. Knox to the shareholders:

> The actual expense will be nearly three times that amount [the book value of the property destroyed]. As we do not care to swell the figures in our books by that sum, we have written off from reserves nearly two-thirds of the expenditure and leave the balance as a reminder of the need for avoiding fires in future.[5]

In the same year came an explanation:

> . . . About the proposal to increase the paid-up capital of the company [by using undistributed profits standing in the balance sheet] . . . I may now remind you that this is merely the continuance of the policy of the company to keep the shareholders' capital in a more or less reasonable proportion to the cost of the assets of the business.

[5] C.S.R. carried its own fire risk on factory buildings and plant.

In 1927 also:

> . . . in a business affected by droughts, cyclones, strikes and political hazards, you should take what is offered to you, and be thankful that the amount is not less than you desire or expect.
>
> . . . the sum paid annually for dividend and bonus has never yet amounted to 5 per cent on the cost of the assets . . .

The last statement about the dividend not exceeding 5 per cent on cost of assets had been repeated many times over the years from 1900 to E. W. Knox's death.

In 1928 Mr Knox tilted at the conventions (to which he himself nevertheless paid some regard, as shown by the second of the above quotations) and showed something of his personal convictions about shareholders and proprietors, as distinct from rentiers who loaned money. He said:

> Any outside liabilities we may incur are for a short term and are discharged by the sale of the sugar stocks, so that your business stands on its own feet. It does not, therefore [i.e., if not employing borrowed funds], matter whether the factories or other fixed assets appear in the balance sheet at something under cost—as is our practice—or, as in the case of an important Dutch company, carrying on a similar trade, each factory is put down in the assets as valued at £1. The point to be borne in mind is that the capital needed for the extension of the trade should always be provided by the shareholders, or from undistributed profits, so that you may continue to really own this business, as is now the case.

In his mind shareholders were what the word said they were—sharers, partners, part-owners. He would have nothing to do with any misconceived idea that such entrepreneurial investors and co-owners (although he did not use the words) were to be rewarded, as if they were rentiers, by some percentage on the amount of money they originally put into the company or were persuaded to leave in it.

The value of the business to its "proprietors" was what mattered to E. W. Knox and it had little or nothing to do with the cost of its assets but a great deal to do with its potentiality for earning in the future. Cost of assets was to him an incident that had occurred in the past—something now dead and of no significance in respect of current realities. It certainly could not represent true value. It would be better, he thought, to use a purely nominal value, which could not in any circumstances be confused with real value. As has been shown, however, he could not in practice turn so far away from convention, despite his

inclination. During the period when the company was in debt he and his father had been scrupulous that the balance sheet values should not exceed real or realizable values (e.g., factories at their value for removal) so that creditors would not be misled.

The Meaning of Shares and Dividends

A point of interest is that within a year of E. W. Knox becoming chairman the board's reports ceased to refer to dividends as a percentage and stated them as an amount per share, a practice which has continued ever since. A dividend of 7½ per cent on a £20 share became a dividend of "30*s* 0*d* per share". Such seemingly simple concepts and expressions can have importance.

There is a class of investor, of high value to individual businesses and to the community, which prefers a contract that defines the investor's position very firmly in terms of precise money sums—as to the amount of investment, the annual interest and the amount to be repaid—and generally also gives him a mortgage for security and fixes the date of repayment of the capital. In such contracts and on the certificates issued under them the "£100" and the "6 per cent interest per annum payable half-yearly" have exact meanings, contractually enforceable. But the real wealth of a business has no fixed value in terms of money (even in times of no currency inflation), whether one considers the value of the assets or the estimated current value of future profits. Forming and operating a business cannot be financed fully by investors of the class just described—generally included in the broad term "rentier". Some investors must be found willing to bear the risks by accepting the element of values which fluctuate—up and down. These are the equity shareholders or ordinary shareholders. They must be content to wait for and accept the unpredictable residues of value, both annual profit and capital, after all the others—creditors, employees, suppliers, governments and the rest—have taken their dues.[6]

One purpose, and perhaps the basic purpose, of equity capital is to absorb variations in the value of the company as a whole. As this value constantly fluctuates so the value of the equity capital constantly fluctuates—and so the value of the respective shares in the total equity capital must also fluctuate. Any label on the "shares" which implies a fixed money value is misleading, once it passes the stage of indicating

[6] A recent review of the results of 1,070 Australian public companies (in *Australian Financial Review* of 26 April 1956) for what most people would regard as the very prosperous year 1954-55 showed that one company in thirty-six made a loss, and one in twelve paid no dividend to its ordinary shareholders.

the amount the investor originally agreed to contribute to the enterprise. Taking the owner of 10 "shares" in C.S.R. as an example, the *ordinary* or equity shareholder should think of himself as the owner of a fraction of the whole C.S.R. company equal to $\frac{10}{702{,}000}$. He owns that fraction of the net assets of the company and of its profits. It makes no difference to the respective real shares in the business of the co-owners whether the "shares" are stated to be of £100, £20, or £1, or are of no stated value.

This is recognized in the United States and Canada where companies may (and very many do) divide their capital into no-par-value shares. This system has been in operation in those countries for over a quarter of a century; after some initial difficulties, it has worked well and is not a subject of controversy.[7]

There have been mischievous consequences for both business and the national welfare from the customary machinery of calculating and expressing ordinary dividends as a percentage of a money figure. This practice confuses the proprietorial and risk-taking class of venture capital with rentier finance. It causes further confusion in the minds of those unacquainted with such business matters when over a period of years profits have been withheld from distribution to shareholders (although owned by them); the percentage figure for profits paid out in later years as a result of employing all the shareholders' funds, but expressed as a percentage of the lower figure—of the par value, or of the "paid-up" value—may appear as a high percentage.[8] The confusion outside business circles often becomes still greater when the time comes to reorganize and restate the balance sheet, as a result of relative business success (or failure) or of changes in the value of money. To this confused state of affairs can be added the misleading effect of the admittedly convenient administrative or mechanical device of calculating dividends paid in current £s as a percentage of a very different thing—the older and more valuable £s originally contributed (e.g., perhaps as a percentage of prewar £s worth three times as much). These things have almost certainly had most serious inflationary consequences for the nation in the mistaken impression about the level of profits and dividends given to the public, arbitration courts and others. The problem seems to arise because large sections of the public

[7] A committee appointed for the purpose by the British Board of Trade has recommended that companies in the United Kingdom be allowed in future to issue shares of no-par-value.

[8] A further example of the complexities is that often shares are paid up in cash to a higher figure than the par value; e.g., C.S.R. shares issued "at a premium" in 1950. Shareholders paid in £27 per share for a share of £20 par value; they receive the same dividend per share on the new shares as on the old.

are taking an interest in business results but the language used by business carries many words and phrases the meanings of which are not completely what they seem. Business men, accountants and others in the commercial sphere almost subjectively place their own qualifications and meanings on some words and phrases which, in other spheres, often become a misleading means of communication. As a consequence, facts and ideas get distorted and actions are misdirected.

The Result of Prolonged Saving

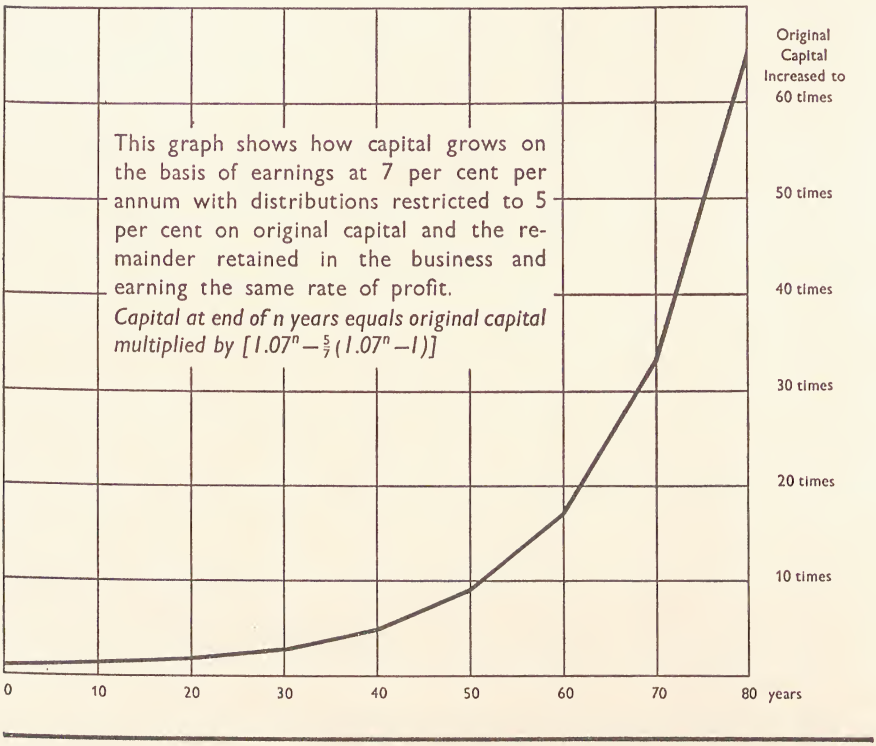
In 1931 E. W. Knox told the shareholders: "For forty years we have, each half-year, left in the business more or less of the profit we earned", and he referred to "the effect of the law of compound interest on such a disposition of our earnings . . ." This can be considered in the light of repeated statements that dividends had not exceeded 5 per cent of the cost of assets and of the business having been operating for about 75 years on similar principles.

There are not many who do appreciate what can be accumulated over a really long period of compounded savings, if one has the ability and force of character to adhere to the practice. We can calculate the results, taking for purposes of demonstration assumed figures which suppose an earning rate of 7 per cent on all funds held and a limitation of dividends to 5 per cent on the original capital.

As the starting point we can take 1887, the year of registration as a public company. Under the conditions stated, the 1887 funds in 13 years to 1900 would have increased by nearly half, to one and a half times the original funds. By 1934 (the year of the last major reorganization of capital) the 1887 funds would have increased after 47 years to about 8 times, i.e., an original £100,000 would have become nearly £800,000. These calculations make no allowance for further cash subscriptions by shareholders, nor for changes in the value of money and consequent so-called "appreciation" in asset values. If the process were continued for 100 years the capital would increase 248 times. The results of this compounding process, together with the formula, are shown in the accompanying graph.

These are startling figures. While they show what can be done from fairly low profit levels with enough self-denial and determination, such results were not approached in practice by C.S.R. over a long term. The transferring to individual shareholders as share capital of part of the profits so gained, after being held for a time, and the subsequent payment of dividends thereon entirely alter the mathematical effect compared with continuous compounding.

POSSIBLE CAPITAL ACCUMULATION FROM INVESTMENT IN THE BUSINESS OF RETAINED EARNINGS


This graph shows how capital grows on the basis of earnings at 7 per cent per annum with distributions restricted to 5 per cent on original capital and the remainder retained in the business and earning the same rate of profit.
Capital at end of n years equals original capital multiplied by [1.07ⁿ − 5/7 (1.07ⁿ − 1)]
Original Capital Increased to 60 times
50 times
40 times
30 times
20 times
10 times
0
10
20
30
40
50
60
70
80
years

During the depression the company's profits declined some 20 per cent, in terms of money, but the dividend rate and amount were sustained. Therefore shareholders' current spending power was well catered for because the value of money rose 15 per cent, or perhaps 20 per cent. Total profits about held their own in purchasing power.

In 1934, within two years of E. W. Knox's retirement, a large issue of ordinary shares was made without getting in cash from the shareholders. This is generally called a "bonus" issue, but the adjective should be properly understood. Share issues of this kind are really a subdivision of a company into a greater number of shares; while no cash is received, neither is any paid out; the profits and earning power of the company concerned are not affected. In this case, the issue being one new share for each one held, the dividend rate immediately fell to half and each shareholder, if he sold no shares, would have received the same total dividend as previously. The shareholder's equity in the company and the fundamental value of it did not alter.

The value assigned to the issued shares for internal accounting purposes was obtained partly from previously-published profits held undistributed in the business (£1,950,000) and partly from a revaluation of some of the assets (£3,900,000). The distribution of the previously-retained profits as capital instead of as dividends is a normal procedure and needs no comment. In regard to the assets revaluation the new chairman, E. R. (now Sir Edward) Knox, told the shareholders that it was "in order that they [the revalued assets] may stand in the balance sheet at values approaching their present worth"; and he added, "This adjustment has no bearing whatever on the price of sugar nor on the earning capacity of the company."

The company in its history has made three share issues from sources not previously specifically disclosed in money terms in the accounts. In those three cases it had been apparent for some years beforehand from the information given to shareholders that the real current value of the company's assets was in excess of that appearing in the accounts. The three issues were:

> the allotment in 1915 of £3,250,000 worth of fully-paid-up preference shares in the Fiji and New Zealand company;
>
> the £2,275,000 in 1923 from the Fiji and New Zealand company, made up of £650,000 used to pay calls on shares and the allotment of £1,625,000 in new shares as the counterpart of the Fiji and New Zealand assets brought back to the parent company;
>
> the amount of £3,900,000 assets revaluation in 1934.

All other issues were paid for in cash, or kind, or derived from published profits held back from distribution in the normal process of thrift.

Changes in Profits, Capital and Output Since 1934

After the 1934 issue the dividend rate fell from 50*s* 0*d* per share to 25*s* 0*d*; that is, conventionally expressed, from 12½ per cent per annum to 6¼ per cent. The highest it has reached since, including bonus dividends, was 42*s* 0*d* in 1949, until the isolated centenary bonus was paid in 1955. The ordinary dividend rate in 1955 was 38*s* 0*d* per share and in 1956 40*s* 0*d*. (While C.S.R. practice is to express dividends as an amount of money per share, the conventional method of expressing them as a percentage seems certain to continue for the time being as the method of common usage and stock exchange parlance. In the absence of the development of no-par-value shares the consequences will, however, be mitigated the more widely the weaknesses of the conventional method are understood.)

During the war money profits declined, owing mainly to the effect of the war on the milling side of the business. Production declined heavily and the United Kingdom Government bought all the Empire's sugar exports at prices which were generally below the world market price although satisfactory in relation to prewar prices. There was no repetition of the gains made from milling during and after World War I. Raw sugar markets had become much more organized and controlled, as explained in the chapter on the structure of sugar markets. This removed some of the risks and losses when times were bad, and it prevented gains when war and world shortages of sugar occurred. During the war taxation was heavily increased and inflation was considerable. Inflation became very severe in the postwar years. By the time it became possible to get the materials and labour for deferred replacement, and even for deferred maintenance, the cost of carrying out such work had risen enormously.

The position following the major reorganization of the balance sheet in 1934 is shown below and compared in monetary terms, without correction for changes in the value of the £, with the 1956 results:

	1935	*1956*
	£	£
Paid-up capital	*11,700,000*	*14,040,000*
Profit for year	*931,949*	*1,679,636*
Dividend	*731,250*	*1,404,000*
Rate per share	*25s 0d*	*40s 0d*

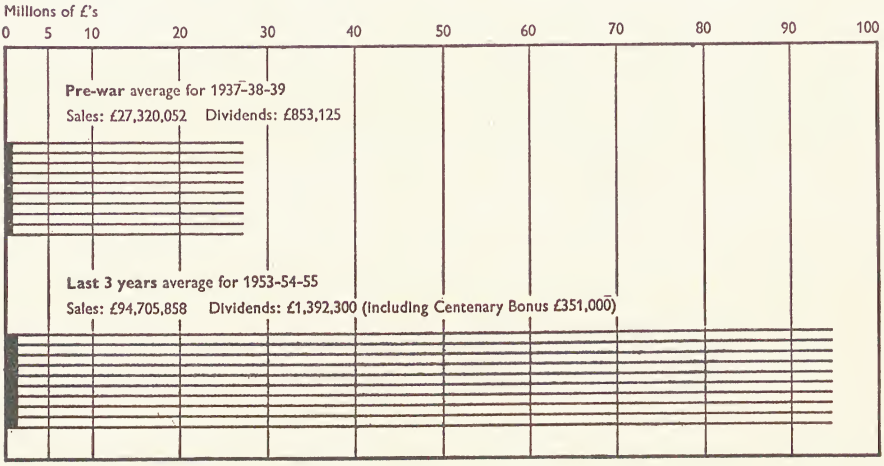
During the last 21 years capital has been increased by £2,340,000 paid in by shareholders (plus a premium of £819,000 on the new share issue). Also £7,000,000 was raised in 1952-53 by two issues of debentures.

The shares and debentures were issued to provide funds to carry out "the programe of expansion and replacement". The shareholders were informed that "the declining value of money has increased the financial requirements. . . . The provision of adequate capital is one of the major problems facing private enterprise in Australia. The incidence of taxation and other aspects of government policy are making it increasingly difficult for companies to save the money needed to maintain themselves, let alone allow them to accumulate funds for expansion." And, "Considering present conditions, your directors decided it was in the best interests of the shareholders to obtain additional funds by issue of debentures." 6,900 investors—individuals and institutions widely spread in the community—quickly took up the £7,000,000 of debentures.

The accompanying chart from the 1955 annual report of the company shows the total value of goods and services handled by C.S.R. The annual average for the immediately preceding three years was £94,705,858.

C.S.R.'S SALES REVENUE AND DIVIDENDS

This diagram compares dividends received by shareholders (black, on left) with the company's total revenue (lines, on right). The figures for total revenue from sales of goods and services include investment income.



In the figures set out below the upward trend of the company's economic contribution to the community, as indicated by the aggregate tonnage of products manufactured by the company, is compared on an approximate basis with the downward trend of the economic rewards for the owners of the company, as indicated by dividends after correction for the change in the value of money. Qualifications would be needed for fine comparisons but the broad general directions of movement in the rewards for the community and for the owners are clear. The extent of the error that arises from not adjusting monetary figures in a period of inflation is also indicated.

	Tonnage of Manufactured Products	*Total Dividend in £s Uncorrected*	*Total Dividend in 1956 Currency*[9]
1935 ..	*633,819*	*£(1935) 731,250*	*£2,159,863*
1956 ..	*1,168,431*	*£(1956) 1,404,000*	*£1,404,000*
Tons Increase	*534,612*	*Increase £672,750*	*Decrease £755,863*
	Increase 84 per cent	*Increase 92 per cent*	*Decrease 35 per cent*

[9] The corrective factor is the Commonwealth Statistician's "C" Series Index of retail prices.

In this period the company expanded in sugar and developed outside sugar. The first new development was into building materials; the initial major step was taken shortly before the war with the erection of the "Cane-ite" factory, but most of the development was postwar. The second development, into industrial chemicals, occurred mainly after the war. Some of the new ventures have been prompt financial successes and some have been slow to contribute to the company's profit. In this period the business and the owners of it have felt the effects of World War II, of the postwar inflationary spree and its numerous attendant problems, of very high taxation on public companies and of various controls and shortages. These matters are discussed in *Notes on Some Effects of Inflation, Taxation and Direct Controls*, p. 355 (Subsequently referred to as the *Notes*).

II

CORPORATE CAPITALISM IN A MIXED ECONOMY

The following section, as was indicated in the preamble to the chapter, considers the functioning of corporate capitalism in its relationship to the economic and social structure of our community. Consideration of such complex matters does not lend itself to easy exposition. In this field there are, inevitably, differing views. But it is important that here is a considered and responsible statement of a point of view which reveals an appreciation of capitalism's social significance.

The section begins with an introduction which refers to the mixture of governmental and private activities in our communities. A main proposition is that capitalist institutions such as C.S.R. have, as well as an economic role, an important social role and play a part in the maintenance of the basic freedoms of Western civilization.

Having developed these general themes and expressed views on the part to be played by private capitalism in social and material progress, the section then proceeds to examine several of the factors which determine the effectiveness of capitalist institutions in making their best contribution. The introductory section is recapitulated briefly and the subsequent discussion is outlined on page 316-17.

Introduction

The financial history traversed in this chapter is largely a story of how Edward and E. W. Knox and their assistants and successors faced difficulties and overcame them, grasped opportunities and, above all, adventured into new fields; and how in the process they enhanced their own fortunes, the fortunes of their shareholders and the fortunes of the communities in which they built their productive organization.

Since the period of the first two Knoxes there have been changes in the nature of that organization and of the environment in which it operates. Both have become more complex. There has been a steady and accelerating evolution over the last fifty years towards a mixed economy in which considerable segments have now become publicly owned or controlled while the bulk of society's productive equipment remains in private ownership, although much more widely dispersed than previously.

In Australia and New Zealand this trend has moved along much the same lines as in the United Kingdom. In the United States, the most productive economy in the world with by far the largest real

income per head,[10] and in Canada, another highly productive economy, some of the same trends have occurred. The emphasis has been somewhat different in these two countries, however, and public ownership and control have not developed to the same extent. In all of these countries dispersal of ownership and reduction in inequalities of wealth and income have proceeded steadily; and ownership and management over large areas of the field of production are no longer concentrated in almost identical hands.

Within such mixed economies much of the responsibility for the task of producing goods and services lies with the private corporation. The Colonial Sugar Refining Company of 1955 is typical of those large-scale corporate capitalist institutions on which much of this responsibility rests. It has a separate legal entity and pursues its own particular objectives, but it exists only as a part of the society to which it belongs and its special ends must, therefore, be subordinate in the long run to broad social ends. But it is a concern of society that in the pursuit of those broad ends the productive vitality of industry is not unduly impaired.

The specific problem of ensuring material progress is one in which C.S.R. has a direct and "vested" interest for, as a capitalist element in a mixed economy, the company cannot prosper in the long run if the community does not also prosper. And to recognize this is not to disregard the fact that modern civilization has objectives other than the engendering of purely economic prosperity (high though it places it as a goal) and the modern capitalist corporation, as part of that civilization, must contribute towards the achievement of these other goals.

The fundamental role of the corporation, however, is economic—to advance the frontiers of material welfare. The effectiveness of the corporation in performing this task is affected greatly by the way in which some matters of prime importance to the community are handled: there are decisions on the proportion of total resources to be set aside for armed defence; methods of increasing the proportion of resources saved and accumulated in order to provide for the material foundations of the future; the manner of influencing or arranging the

[10] Average national incomes per head in 1954 in local currencies were:

United States	$ U.S. 1,845
Canada	$ Can. 1,234
United Kingdom	£ Stg. 310
New Zealand	£ N.Z. 383
Australia	£ Aust. 440

The figure for the United Kingdom is gross national product per head.

—*Source*: *United Nations Monthly Bulletin of Statistics.*

distribution, or redistribution, of what remains of total prosperity for consumption in the present.

Widespread distribution of material welfare, in sufficiently large individual amounts to ensure a high degree of material freedom for individuals and groups, is utterly and fundamentally dependent upon the total amount of production. Although there is such an obvious contrast between primitive communities having little surplus above subsistence needs and our societies with their remarkable wealth of goods and services, it still seems necessary to remind ourselves that the sharing of goods and services depends first of all on ensuring that they are actually produced. Our high levels of welfare are the outcome of combinations of many factors such as the harnessing of power, the use of machines, the fertility of acres, the application of science, the willingness and ability of men to work, the device of limited liability, the re-investment of savings to provide capital tools for the future, and the incentive of profit. Much attention has been devoted in recent generations to the comparatively simple matter of distributing the product. And less attention has been apparent in Australia and New Zealand, at least in the political sphere, to the difficult and delicate problems of preserving and enhancing the circumstances which made the product available for distribution in increasing quantities.

These problems are more and more affected by the increasing complexity of the productive system on the one hand and of social organization on the other. The economic, technological and social facts necessary for right judgments are intricate and difficult to discover. The techniques and even the nomenclature of economic mensuration are still inadequate and imprecise, and the whole field has been immensely complicated by inflation.

As to the roles other than the production of goods and services, the modern corporation has its own part to play, in varying degrees, in such matters as the social relations of people as individuals and groups, the reconciliation of their respective interests and aspirations, and the reconciliation of group interests and public interests. These responsibilities stem from the fact that a corporation is more than a legal concept, for it is owned by people, operated by people, supplied with goods and services by people, and sells its goods and services to people; thus the corporation becomes endowed with a character and a personality which are the reflection of the individuals who compose it. To promote co-operation, harmony and long-term efficiency the owners, operators, suppliers and customers need to be satisfied, as people, with the respect and recognition, as well as with the material rewards, accorded them through the relations established by their association

with individuals and groups through the corporation. It is important for the people in each group to remember, if co-operation is to be engendered, that those with whom they are linked through the corporation are people like themselves, with similar hopes, desires and motivations. In this field the basic consideration is the responsibility of people to people.

One of the biggest problems which people have always faced, and probably always will face, is that of ensuring consistent effort towards the fulfilment of the communal goals of an organized society without surrendering individual liberty and vitality to a too-powerful central authority. Part of the answer has perhaps been found in those Western democratic communities of educated and mature peoples with parliamentary systems of government, where political responsibilities and experience are spread and there are checks to both political and economic power. It is no mere coincidence that joint-stock capitalism developed furthest in the same communities that adopted those forms of political organization; joint-stock capitalism seems even to be another part of the answer.

While the basic concepts of Western society have not changed, social conditions have not remained static and capitalism also, as part of the whole society, has been progressively evolving. It must continue to do so. Because capitalism's role in such communities is both economic and social, those who hold positions of leadership in private industry carry responsibility to ensure that, while its productive efficiency is continually being increased, it is enlarging opportunities for people to lead still fuller and more significant lives.

Capitalism already provides a means of obtaining high production and of allowing at the same time wide participation in responsible activity and in the ownership of property. It already allows considerable personal freedom in many fields—in choice of employers and employment, in choice of consumption, in association and dissociation; and it already provides wide scope for individuality, initiative and the enhancement of personality. As part of a social order in which men seek not only increasing material welfare but also opportunities to lead more meaningful lives, capitalism can continue to contribute. Two factors will assist its progressive development: the manner in which members of capitalist enterprises discharge their diverse responsibilities; and the encouragement and approval bestowed by the community upon such enterprises. This paragraph states a vital point, to which we shall return.

The system of production employed by a community largely determines its level of material welfare, but in addition it inevitably

and greatly influences the nature of social organization, the quality of lives led by people, and the practical degrees of freedom *from* coercion and freedom *for* individuality. It is not easy, therefore, to avoid the conclusion that the continuation of the Western way of thought and life will be most difficult, and perhaps impossible, without the continued existence and progressive development of capitalism.

Alternatives to the capitalist system of production are often advocated but none could be substituted for it without at the same time substituting other values and other standards for those we regard as representing the Western tradition. Neither is it possible to return to those earlier economies where families or groups shifted for themselves on the basis of subsistence husbandry and cottage industry; nor even to the *laissez faire* capitalism of a century ago. Evolving capitalism seems to be, in our time, the only real alternative to government ownership or control of "the means of production, distribution and exchange"—in other words, the only alternative to a centralized authoritarian state and the rejection of the Western tradition.

Summary of Argument

The issues in this field are complex. Slogans and rallying-cries prejudice balanced discussion. Some of the words normally used to discuss the varied ideas have several meanings. Any attempt to summarize shortly in this field runs the risk of over-simplification, also the risk of the summary being quoted out of context. Nevertheless it may promote readability to outline the general theme by summarizing the arguments already put and sketching the discussion to follow.

The two main propositions that have been set out can be combined and expressed in another way even if somewhat over-simplified: evolving and encouraged private capitalism, aware of its various responsibilities and functions, seems to be a requirement for the continuation of progressive Western democracy. The assumption is that our democratic society should maintain its freedoms for the individual in the economic, political and cultural fields, while continuing steadily to expand its level of material welfare. Economic conditions and methods of organizing for purposes of production have a tremendously powerful effect on the other conditions of any society. There is no evidence to support the view that freedom is divisible; that it can be removed or greatly reduced in the spheres of production and economics and permanently retained in other spheres; that freedom of the person is not endangered in any society that tends increasingly to disregard freedom for the person's property and for his economic actions.

It has only been possible in the introductory section to give a fragmentary view of our mixed economy and of the role of the corporation, but it sets the background for the further delineation of the main propositions. The discussion which follows starts with an examination of the progress in recent years in Australia in raising material welfare. This leads to a discussion of policies and steps to be followed in order that material progress may be steadily advanced; and mention is made of some of the factors holding down production. These inhibiting factors include the inadequacy and inaccuracy of economic, accounting and statistical data; the preoccupation with questions of consumption and distribution to the detriment of attention to production; and the failure to develop a co-operative approach to the goal of higher production—which in turn requires appreciation of the roles of investors and owners and of managers of corporations. Reference is made, subject to the limitations of a very short essay, to the links between, as well as to the conflicts between, capitalism, freedom, authority and the traditions of our civilization. Finally a warning is given that steps taken to solve the problems and difficulties of the moment, or perhaps to camouflage them so that they are lost to sight and conscience is eased, can surreptitiously, and even unwittingly, undermine some basic values and basic conditions. The danger is that fundamental considerations are often lost to sight and largely ignored in the contemporary hurly-burly and through the application of opportunistic palliatives.

All these matters are relevant to the functioning in our mixed economies of that corporate capitalism to which C.S.R. belongs.

The Unsatisfactory Trend of Real Income per Head in Australia

The material standards of a community are indicated by "the total amount of goods and services becoming available for consumption or for adding to wealth". (Consumption includes usage for defence purposes and for social services.) The greater the amount consumed, the less is the amount available for savings to be used to generate increased future wealth.

The total amount of goods and services becoming available, measured in money terms, is called the *national income*. One of the best available measures of material standards is provided by dividing national income by the total number of persons in the community. The resultant figure is known as *national income per head*. National income statistics are compiled and expressed in terms of money values, but money values vary, particularly in times of inflation, so that valid comparisons between one year and another can be made only by adjusting nominal

money values to allow for the variations. By using such adjusted values one arrives at the trend of *real income per head.* Progress in raising material standards is indicated by the rate at which real income per head is being increased.

In recent years there has been marked progress in increasing real income per head in the United States, Canada, the United Kingdom, Western Germany and the Soviet Union. How does progress in Australia compare? There are different measures of the rate of growth and somewhat differing opinions about what growth has occurred. These differences are sometimes accounted for by differences of definition. We have taken some trouble to have the facts checked, however, and we believe that a fair view of the position in Australia is set out in Appendix 33, *Postwar Economic Progress in Australia.* This appendix is a survey by Economic Services (Messrs Colin Clark and H. W. Herbert).

One of their main conclusions is: "The discouraging thing . . . is that the long-term trend shows practically no progress at all [in Australia] in real income per head. This stagnation of real income per head has been obscured by the growth of the Australian population and by the inflation with consequent big money turnovers. Turning now to the comparison between Australia and other countries in growth of real income per head . . . relative lack of progress in Australia is striking. Summing up we can say that in seven years since 1947-48 real income per head in Australia, although experiencing a temporary increase in the wool boom, has not increased. The figures for Australia are:

Base 1947-48 = 100; 1954-55 = 102."

Comparative figures, calculated from Appendix 33, are as follows:

	Index of real income per head in 1955 on base 100 = average of 1947 and 1948	*Index of population increase over 7 years to 1954 on base 100 = 1947*
Canada	*117½ (7½ years)*	*118*
United States	*117 (7½ years)*	*113*
United Kingdom	*116 (7½ years)*	*102*
Australia (on base year ending 30.6.48)	*102 (7 years)*	*119*

Furthermore it is likely that these figures, particularly in the case of Australia, the country with the greatest inflation in this period, overstate the increase in national income to an extent that cannot be estimated.

This is because in a period of inflation the *National Income Papers*, from which the Australian data are drawn, overstate net "National Income" and also the increase in it (unintentionally but not necessarily unavoidably), insufficient allowance being made for the replacement of assets used up in production.[11]

These facts are indeed "discouraging". The position is partly due to the high rate of immigration and the larger proportion of the population of school age. This does not appear to be an acceptable excuse for Australia's poor performance, however, because Canada has increased her population by an almost identical proportion, while raising real income per head satisfactorily. In the United States, too, there is positive achievement in both directions. Other comments by Messrs Clark and Herbert on the significance of the switch from primary industry to secondary industry and on the increase in government spending also warrant serious thought; and they direct attention (if these movements continue unchecked) to the still more pressing need to raise productivity in secondary industry and probably most of all in the transport and service industries. But the overall situation appears beyond doubt: our average real income per head is stagnating and this must be a cause for real concern. Even if finer analysis can present a somewhat better or a somewhat worse verdict on the Australian performance, this would not alter the broad conclusion; nor alter the emphasis in the discussion which follows on the need for greater production per head.

Unrecognized Effects of Unmeasured Redistribution

Most Australians who now feel prosperous will have difficulty in believing that average real income per head has not been rising sharply in recent years. Many people are convinced that they are better off and there is little doubt that this is true. But since the average has not improved there must be numerous losers, and some heavy losers.

It is generally appreciated, for instance, that unskilled workers have improved their position in comparison with retired people on fixed monetary incomes, but the comparative gains and losses of many groups in the community are not so apparent. Much of the evidence on which comparisons could be based is not readily obtainable for it is a field where data are scarce and where little research has been undertaken. Moreover, the facts have been obscured by the habit of looking at statistics and thinking in money terms which, being

[11] In order to assist the reader, much of the detailed argument and the statistical analysis which bear upon this discussion are submitted later in the *Notes*.

variable, are misleading and constitute an entirely unscientific and unreliable yardstick.

There seems to be considerable evidence that the economic position of many people has been worsened in comparison with other sections of the community to an extent which involves, *prima facie*, some degree of social injustice. That there has been little widespread appreciation of the element of injustice, and no energetic movement to redress it, are due to two main reasons: those who have suffered have not generally been organized in politically articulate and influential groups, and there has been no adequate measurement of the degree to which the national income has been redistributed. It must be granted that, in a field where subjective value-judgments apply, it would remain difficult to obtain a high degree of general agreement on the justice of the present distribution of national income. But in an important field where social justice is in question and economic progress is involved it would seem fair to ask that, as a matter of honesty in national stewardship, the facts should be examined and, as far as is practicable, made known; and that established methods, used in other countries, of improving the accuracy of the yardsticks be employed.[12]

Much of the redistribution of national income has been haphazard. For instance, inflation has probably been responsible, more than any other single factor, for arbitrary and capricious alteration of the comparative economic position of various groups in the community. But other factors have also influenced the situation. There have been high taxation, sometimes of an unintentionally discriminatory nature; rent and price controls administered with more regard to political expediency than to either justice or economic facts; and higher wages for shorter hours—even higher *real* wages—without greater output. All these are factors which have effected probably as great a redistribution of national income as measures such as social services, undertaken as matters of considered social policy.

Those groups which appear to have suffered a worsening of their economic position include retired persons, many professional people, owners of rentable houses, owners of claims to money such as bondholders, most producers of exports, salaried men, and others who include shareholders of a wide range of industrial companies such as C.S.R.—most of them making a considerable contribution to the welfare of society.

The facts about the financial rewards for shareholders in industrial companies have been masked not only by the inflation of monetary

[12] It is recognized that measurement in this field is difficult and it appears that in Australia some improvements are planned, although others have not been mentioned.

values but also by the undoubted success and prosperity in recent years of certain types of business which operate close to the consumer, as in the hire purchase field. But these are not typical of the whole field and especially are they not typical of a large part of long-established and more basic industry, whose shareholders have suffered a worsening of their economic position to an extent which very few people realize, and for which no justification is apparent.[13]

Judgments, even on the grounds of utility, of the present distribution of the national income are beset also with problems arising from the absence of adequate data. Some will argue that, compared with twenty years ago, the direction and perhaps even the extent of the redistribution are desirable. To some degree, and in respect of some recipients of a greater share, there would be little disagreement. But the gains and losses of others, particularly those who have benefited or suffered arbitrarily, and indeed surreptitiously, because of inflation, are difficult to justify on the grounds of either justice or utility. Some groups which have contributed little or nothing to the material or non-material advancement of the nation have gained from inflation. Others have gained by organized political pressure without attempting to make a fair contribution to the community. Other groups whose efforts have been genuine and some whose contributions have been substantial have lost ground.

Answers to questions that naturally arise in this field are not easy to obtain. Who exactly are the gainers and losers? What is the extent of the gains and losses? Given an answer to those questions, one may ask: Has the redistribution been equitable—in direction and in degree? Has it promoted economic development if it has not promoted justice? Or has it inhibited total growth? Would a higher rate of total growth have been better, thus providing more to be shared?

The answers would be sought in three different fields: that of the depth and intensity of the community's interest in increasing total material welfare, that of justice, and that third field without which answers on material progress and justice cannot be given—more complete and more accurate information.

The Advancement of Material Standards—"Productivity"

If the improvement of material standards is to be stimulated by purposeful and consciously-developed policies, it is desirable to consider the means available in a mixed economy within a non-authoritarian

[13] See the *Notes* for a discussion of the whole field of company incomes, based on figures in the *National Income Papers*. Results of a sample of prominent companies are also given in these notes.

society to achieve the advancement. There is no general agreement on these things, for both individual and community values vary greatly in such matters as the desirability of quickly-rising living standards, the relative importance attached to more work as compared with more leisure and the desirability of doing without things in the present in order to be militarily secure or better off in the future.

If we lived in a non-competitive world we could afford to take an easier attitude to some of these problems. Even then, it is hardly likely that people in Western countries would decide against increasing material production and the benefits it confers in higher standards of living—goods and services, health and education, and leisure. We must continue to progress—it can hardly be argued otherwise. Even Albert Schweitzer, concerned as he is with the imbalance of material and spiritual forces in civilization, considers that "the highest possible material freedom for the greatest possible number is a requirement of civilization".[14] In another place, too, he says: "In what does it [civilization] consist? First of all in a lessening of the strain imposed on individuals and on the mass by the struggle for existence. The establishment of as favourable conditions of living as possible for all is a demand which must be made partly for its own sake, partly with a view to the spiritual and moral perfecting of the individuals, which is the ultimate object of civilization."[15]

There is no general agreement on optimum rates of increase in material welfare as measured by the national income per head. 4 per cent per annum would probably be a high rate to sustain for long in a democratic country already fairly well advanced. Several Western countries have comfortably exceeded 2 per cent per annum in the postwar period. 3 per cent is often referred to as a practicable and desirable rate and has been sustained by some countries. It would certainly be a far better performance than Australia has achieved in the past ten years.

How can a reasonably high rate of increase be attained in Australia? Leaving aside the effects of bountiful seasons, droughts and other acts of God, changes in the proportion of workers to total population and lengthening the average working life, and assuming that there will be full employment (as has now been the case in Australia for sixteen years), it becomes mainly a question of achieving greater average production from men and women at work. This seems to

[14] *Civilization and Ethics*, Chapter XXII.
[15] *The Decay and Restoration of Civilization*, Chapter III.

be the crux of the subject generally referred to as "increased productivity".[16]

Longer standard hours can be ruled out as contrary to existing social trends.

More effective and more continuous effort within accepted working hours could make a significant contribution in some sections of industry. It is mainly a question of organization of work and of attitudes, and not primarily a question of harder, more wearing and more rigorous effort.

Better efforts in this direction seem to depend partly upon incentive schemes, difficult to devise and introduce though they often are. Such schemes, however, combined with better employer-employee relations, a reduction of restrictive practices and an increasing awareness of the social responsibilities of employees as well as of employers to raise production, could bring important gains in productivity.

In addition to striving for a situation in which people may operate more effectively by better organization of work, one of management's principal contributions to higher productivity is to provide more and better tools of production. And management can do this only if the owners are willing and able to provide more capital.

Associated with the provision of tools is technological improvement with its almost unlimited and still unpredictable potential. But capital investment, sometimes at very high levels indeed, is an essential ingredient and, again, the best results will not be obtained without employee co-operation.

Expansion into industries where the production per worker is high as compared with others where it is low can have significant results for the nation, especially in conditions of full employment. If expansion takes place in industries with high output per worker, then average productivity will rise and so will material standards. And these industries, too, tend to be those where assets per worker are high. Much of Australia's former favourable position was due to the big proportion of production coming from primary industries with their large resources and high output per worker. In the industrial field there are advantages in developing industries with a high level of "horse-power per head". Capital investment comes into the picture again.

An important factor in the national income is the favourableness of the terms of overseas trade. This is affected by skill in buying and selling overseas, and by trade policies; but it can be fortuitous and

[16] It is not thought necessary, in the context of this chapter, to define productivity closely, to discuss various kinds of productivity, to point to distinctions between "production", "productivity", "labour productivity", and the like.

temporary, as in the 1950-51 wool boom. It is affected also by movement in the costs in export industries as compared with costs in countries competing for our export markets. In addition, the terms of trade will be affected by productivity in local industries producing for internal consumption as compared with productivity in overseas countries from which we draw imports. Stated broadly (and despite exceptions in some areas of industry), if productivity were increasing in Australia by 1 per cent per annum but in competing countries at 3 per cent per annum Australia would be losing ground in the terms of overseas trade, with serious consequences for prosperity here. Since Australia's national income is affected importantly by the balance of trade, Australia needs to run quite fast merely to keep her place in the productivity race.

Some Other Benefits of Higher Productivity

The Australian Ministry of Labour Advisory Council[17] made a comprehensive report on productivity in March 1956. It explained that "Productivity gains may be distributed among:

(a) consumers, through lower prices,
(b) workers, through higher real wages and salaries and other improvements in working conditions,
(c) proprietors and shareholders, through higher profits,
(d) businesses and undertakings, through the building up of reserves to provide for re-equipment and expansion."

The Labour Advisory Council also pointed out that higher productivity has significance beyond the increasing of material standards for the individual or for particular groups: "increasing productivity is essential if there is to be a sound and enduring basis for the attainment of our national objectives, such as raising standards of living, maintaining full employment and economic stability, sustaining a high level of population growth and providing for our defence and future national development."

There are those who doubt whether a high rate of economic growth is really wanted and who would be content with existing standards and slow economic growth. In the South Pacific, where the English-speaking democracies are still little more than outposts of Western civilization, it seems that such doubts about the necessity for economic vigour and growth, and excessive concern with greater economic

[17] The council consists of the Minister of Labour, the Secretary of the Department of Labour and seventeen leading representatives of employers and trade unions.

egalitarianism, should be subordinated to the even more vital question: Can we survive *without* vigorous growth? Every change in the political situation to the north of Australia in recent years suggests the answer.

Increased productivity could also ease the tax burden. A recent article[18] dealing with the situation in England estimates that, if production were increased at the cumulative rate of 2 per cent per annum, government expenditure as a percentage of gross national product could fall from 34 per cent, the figure in 1953, to 29 per cent in 1964 and to 22 per cent in 1979. Professor Lionel Robbins commented:[19] "These are very substantial reductions and the rate of increase of production assumed is very cautious. But the underlying assumption is critical; namely, that we do not change the real rates of present commitments. Over the years, a substantial easement is attainable without any positive cuts; all that is necessary is to mark time where we are, not to increase the rate of commitment in one line unless it can be diminished commensurately in another. This is not very much to ask. But whether this degree of self-restraint can be expected of future governments is anybody's guess. Personally, I should be very unwilling indeed to bet heavily on no net increase. But I should be disagreeably surprised if what increase there is should be so large as to wipe out the whole of the possible relief."

If, however, governments continue to take little action to assist industry and the community to deal with the basic causes of inflation, and try to counter merely its surface manifestations at intervals of crisis by raising taxation (which extra revenue it seems they then tend to spend), there is little hope for relief from taxes, and therefore from costs, by this route. Nor is there any hope of preventing further increases in costs and preventing progressive inflation if there is a continuation of the practices of recent years in Australia, where the greatest continuing inflationary force has been the raising of wages and shortening of hours *ahead of or to a greater extent than* the increase in productivity. The possibility is there, nevertheless, that the fruits of higher productivity could be applied towards countering the inflation itself, keeping prices down and, by reinvestment, stimulating productivity still further.

The Importance of Co-operation for Productivity

The British Productivity Council, representing management and wage-earners jointly, has made a lengthy study of productivity and many visits have been made to the United States to study the methods

[18] By Alan Peacock of the University of London in *District Bank Review*, June 1955.

[19] "Notes on Public Finance" in *Lloyds Bank Review*, October 1955.

of production there in use. The council has published the following interesting tabulation of the means of increasing productivity. This is apparently set down with primary application to manufacturing industry, but the concepts clearly have wider application.

MEANS OF INCREASING PRODUCTIVE EFFICIENCY

1 Improve basic processes by research and development 2 Improve and provide new plant and equipment	PROCESS STUDY	Long term requiring capital	NO LIMITS TO RESULTS
3 Simplify and improve the product and reduce the variety	→	Intermediate may require capital	RESULTS SUBJECT TO LIMITS
4 Improve existing methods of plant operation 5 Improve the planning of work and the use of man-power 6 Increase the effectiveness of ALL employees	WORK STUDY	Short term requiring little capital	RESULTS SUBJECT TO LIMITS

Examination of these methods of bringing about higher productivity shows that they are clearly the primary responsibility of management which management cannot dodge. But to obtain results management requires the support of owners of capital for most of these methods and of employees for some of the methods.

The withholding of the support and co-operation of employees, or their active opposition, can reduce or nullify the attempts of management to increase the effectiveness of employees at work. While, as the Australian Labour Advisory Council puts it, "the initiative in increasing productivity must rest with management", there is an onus, too, on employees to co-operate. "The trade union movement", says the council, "must have a special responsibility for educating its members."

Such concepts and responsibilities are by no means rejected by many employees, according to C.S.R. experience, but there is little room for doubt that the genuine acceptance of them on a comprehensive basis could bring about large immediate increases in productivity. We can all think of industries where this is obviously true.

While the above tabulation rightly sets no limit to results in the long term from some of the means to greater productivity and does set limits from other means, it is certain that if there is failure by employees to accept the view expressed by the Labour Advisory Council the benefits that can accrue, even from large investment in better tools of production, will be seriously reduced. It seems likely that one of the important advantages enjoyed by the United States and Canada is that the people as a whole are highly competitive but have at the

same time a more co-operative spirit. They also seem to be less jealous of seeing high rewards for constructive effort going to men and to owners of corporations. There is an undoubtedly deep-seated belief among the American people that work and effort are essentially right and proper, socially valuable and basic to the individual's self-respect. And they accept and understand that distribution and consumption have to be preceded by production. The British productivity teams agreed that there was a very important disparity of capital equipment in favour of the United States. They agreed, too, that the better progress in the United States "was not explained satisfactorily by any question of greater [natural] resources". They did record, however, that "of a series of 78 reasons for the greater productivity of the United States, it was noteworthy that between 50 and 60 were directly attributable to the attitude of mind that existed in the United States towards the question of productivity" among all concerned.

The Importance of Capital Investment

Although the means for the achievement of higher productivity are varied, two are dominant for major long-term improvement. These are, on the one hand, research and technological development and, on the other hand, capital—capital for more and better tools of production (in the very broadest sense) and for greater stocks of materials. As one expert on economics and international affairs puts it: "output per man-hour primarily depends today upon the machine-power that can be put behind each pair of hands. Wealth advances most rapidly in communities prepared to devote a sizable percentage of their national incomes to the introduction of machines . . . the chief reason why the United States is the wealthiest community in the world is that the machine-power behind each American worker's effort is two or three times that of Britain and five or six times that of Europe."[20]

The first requirement, technical knowledge, is growing fast, although there is developing a shortage of trained men to apply the new sciences to industrial production. The second factor, capital, is generally a prerequisite of major gains from technology. In England there is discussion of the proposition that 20 per cent of each year's national income would have to be saved and devoted to investment if there is to be a steady increase of 3 per cent per annum in the standard of living (i.e., doubling the standard of living in twenty-five years).[21]

[20] Barbara Ward, *Policy for the West*, Chapter XI.

[21] See, for instance, Professor Ely Devons in "The Case for Investment and Productivity" in *Lloyds Bank Review*, October 1955. Devons is not concerned therein to argue that the rates of 3 per cent and 20 per cent are precise or optimum rates.

The *Economist* recently observed[22] ". . . there is one simple but vital point which is tending to be overlooked. Perhaps this is because to the professional pundits it seems too obvious to be worth saying, though the result is a risk of confusion to the public. This vital point relates to the role that is being played, and should be played, in the national economy by investment—that is, by expenditure designed to increase real capital, whether in fixed equipment or in stocks of useful goods. It is obvious that if the standard of living is to be doubled in a generation investment, more than anything else, will have to be relied upon to do the trick. If our children are going to produce twice as much as we do, they are not going to do it by working harder than we do (for which they have not been trained) or by being cleverer than we (perish the thought), but by having twice as many inanimate slaves to assist them."

On the possible danger of stimulating inflation further by creating greater demand for capital expenditure, the same article has this to say of the dilemma facing public policy: " . . . if it [the rise in capital expenditure] was responsible in any degree for continued inflation and exchange difficulties, it was because expenditure on other things—on consumption and government activities—did not make room for it."

The right climate and the incentives for a high degree of saving cannot occur if we are too preoccupied with aggrandizement of the central authority, redistributive goals and internal disharmonies (and except for unemployment nothing creates more disharmony and disillusionment than inflation). Obviously these are difficult questions but, if consumption and governmental expenditures (including increased social services and redistribution, various free amenities and some of the more controversial schemes for "national development") are to have first priority, then investment for greater productivity—and with it good progress in raising national income—must take a back seat.

The need to create a genuinely favourable climate for higher productivity is talked about freely enough in Australia and New Zealand, even in the highest places. There are examples of assistance from governments in particular fields of production (although often occurring as steps to treat the symptoms and particular manifestations rather than the basic causes of the maladies of inflation and low general productivity); and there are, of course, some important governmental activities in education, research and development. In practice, however, there is in the sphere of government hardly much more than a low level of attention to basic factors in productivity, to incentives

[22] Article entitled "Focus on Investment" in issue of 4 February 1956.

for it, to discouragement for restriction of it; and the creation of the right climate for productivity is not yet, in the day-to-day affairs of government, treated as a vital matter or even as one of the larger expediencies. It is kept in the background by attention to the smaller expediencies of the hour. These cut across and block the attainment of the greater goal.

It seems timely, for instance, to reconsider some public policies which were evolved in the past to act at a lower measure of intensity as means of redistributing incomes in the community but which now, applied at high intensity, often act in practice to diminish productive capacity and to discourage entrepreneurial drive, and therefore act to retard increases in the level of total national income. Other policies and practices, evolved in a period of comparatively stable money values, fail in the new circumstances to take account of the incidence of inflation, and in so doing deprive industry of much of its ability to replace productive assets, to give adequate rewards, to introduce new techniques and to expand and innovate.

Several of the tendencies just described are exemplified by the anti-inflationary measures of the Australian Government announced in March 1956. Higher taxes, including higher company taxes, were imposed and aroused loud protests, with much argument that the approach was negative and that what was wanted was a positive policy to raise production. Barbara Ward had dealt with these ideas in *Policy for the West*: "There is one point in common to all the anti-inflationary measures discussed so far. They are all negative. They are all designed to prevent something. They all start from the premise that if one thing has to be achieved, another must be sacrificed. In the short run, such an approach is inevitable . . . But as the only policies for combating inflation, as the chief weapons . . . they are all frankly unsatisfactory and insufficient. The very last mood to overtake the free world should be that of defensiveness, careful accountancy and general national cheeseparing. In inflation as in everything else the best defence is attack. The primary aim of the West in anything more than the shortest run must be not to cut purchasing power . . . but to expand wealth and supply and capacity."

In the debate associated with the Australian Government's taxation increases, a university economist[23] who was one of the advisers to the government pointed out that the argument that higher taxation would reduce productivity had little force in the case of indirect taxation (i.e., import and excise duties, sales tax, and similar imposts). Another

[23] Professor P. H. Karmel, in an article in *Australian Financial Review*, 16 February 1956.

economist[24] wrote: "It is because we are so conscious of the need for higher productivity that we place more emphasis on tax measures, which can be made to fall in part on consumption, than on credit measures, which fall almost entirely on investment." The increases were not, however, confined to indirect taxes, although it is not known whether the economists so recommended in their final discussions with the government; the taxation of public companies was increased and this must have an adverse effect on productivity, for reasons examined in some detail in the *Notes*. Known tax and other measures, even if no more initially than "investment allowances" or initial depreciation allowances, would be useful forces in stimulating investment leading towards higher productivity, but no such measures were introduced.

While it is highly desirable when considering counter-inflationary measures to give attention to the reduction of demand, it has to be kept in the very forefront of the considerations that measures which damp down production and supply as well as demand (higher company tax and the removal of production-raising concessions are examples) tend to cancel out in the inflation account; there is a debit as well as a credit and the debit may be greater. Furthermore, when a demand-reducing step holds down production it has the effect, in addition to its limited and doubtful net anti-inflationary consequences, of holding down national strength and material progress.

Preoccupation with the crises of the moment and the adoption of measures to relieve immediate pressures are understandable political tendencies. But when such tendencies imperil the future it is difficult to condone them. A more forward-looking view of political responsibility would prompt more optimistic, growth-minded policies clearly designed to stimulate productivity, "to expand wealth and supply and capacity".

There is a further special reason why production-raising policies, and particularly capital investment, require high priority in Australia at present. The flow of immigrants is increasing our population and our national status. But these immigrants, combined with a rapid increase of the native-born, by their mere additional numbers create additional demand for consumption goods, and also, at the same time, reduce average production per head by diluting the capital tools of production available per head. Merely to cope with the population increase, investment must proceed at a high rate if productive assets per head are to be maintained. (And it must be net available productive assets after allowing at current replacement values for the cost

[24] Professor H. W. Arndt, letter to Editor, *Sydney Morning Herald*, 4 February 1956.

of assets wearing out.) But even that leaves us in a state of stagnation, and progress depends upon a still greater increase in investment. If we assume that, in conditions of relatively stable population, saving for investment at the rate of 20 per cent of the national income is required to raise the standard of living by 3 per cent per annum and so double it in twenty-five years, then a much higher rate of saving and investment is needed to make such progress while a country is rapidly increasing its population—as indeed Australia surely must do.

Inflation, Taxation and Price Controls

The argument has been put forward that the effectiveness of corporate capitalism in advancing the levels of material welfare has been impaired by recent economic conditions, political actions and inadequate methods of accountancy. These retarding factors include inflation and the methods of accounting for inflation—for national and for business purposes and in respect of depreciation and replacement of productive assets. For instance, the methods employed lead Australians to deduce from official statistics that they are saving more of the national income than they really are. High levels of company taxation, the double taxation of the profits of public companies, and price fixing have also had retarding effects.

Discussion of these matters would lead this chapter far afield but, since they raise important and specific problems for corporate capitalism in a mixed economy, they are developed in the *Notes*.

Incentives, Encouragement and Approval for Productive Enterprise

As most of the work of production and the responsibility for economic development is borne by the capitalist part of the mixed economy, one problem of statesmanship is to ensure that capitalist enterprise is not prevented from discharging its tasks nor deprived of its vitality. This requires that attention be given to ensuring adequate rewards, incentives, recognition and approval, while at the same time smoothing out the trade cycle and restraining the development of the other more anti-social consequences of modern capitalism's *laissez faire* progenitor.

It would seem that the problem of ensuring rewards for productive activity is not beyond a solution which pays reasonable regard to the ideal of a qualified economic egalitarianism. At the present time the ownership of property is more widespread and incomes are more even than ever before. There is ample evidence that this trend is being directly promoted by corporate capitalist enterprise, which is both providing the means for and stimulating the development of a property-

owning democracy. The increasing spread and diversity of the ownership of C.S.R. is in itself evidence of the trend. Such corporations are also providing the means for increasing equality of opportunity for individuals to find outlets and rewards for their abilities. The process has been vividly described as a "withering away of the proletariat". Its fuller realization now depends on higher productivity, not on further redistribution.[25]

There is no question of the need to provide adequately for defence and to assure reasonable standards of welfare for the aged, invalid, incapacitated, widowed and orphaned. But it seems that the further large increases in productivity required to continue those services and to raise living standards as well will be achieved only if the productive elements in society are rewarded and given incentives—in non-material as well as in material ways—and if discouragement and disapproval are shown towards those who restrict productivity and withhold their support.

Encouragement and approval from society for capitalist enterprise are of course warranted only where deserved. But if, when deserved, encouragement and approval are withheld the results must be bad both for the enterprise and for the community. High and sustained endeavour is not often forthcoming in the face of derision or discouragement, nor can people give their wills and their hearts to their work in an atmosphere of disapproval. The task of goods- and services-production requires enthusiasm and zest as well as steady application and ability.

To provide the drive while handling the intricacies and the questions of balance that are the concern of the contemporary corporation, such corporations require to recruit to their service many of the best and ablest young men. As P. F. Drucker puts it so well, to attract and to hold this type of man a career, a good living and some economic success are required, but are not enough. Corporate capitalism has to be able to give these men a sense of mission; to satisfy their desire to make a meaningful contribution to society; and to see that that contribution is acknowledged and approved, when fairly earned and merited. The activity and spirit of those who direct, administer and operate productive enterprise—and doubtless of many of those who abstain from consumption in order to provide the investment and own such enterprise—could be raised to a higher level if they were aware of the approval of society for their efforts.

There are hopeful signs that economic and political thought is

[25] Company dividends received by Australian residents, for instance, comprise about 3 per cent of the Australian national income.

developing to a stage which will produce before long a large flow of attention to practical steps to raise investment and production faster. In the field of labour relations, for instance, responsible people are discussing incentives not only in terms of money but also with regard to personal recognition. But it appears often to be overlooked that the psychological drives and urges of individual entrepreneurs, of the members of the boards and managements of industry and of the private citizens who invest their savings in industrial shares, are much the same as those of wage-earners. For they, too, are people with normal human aspirations and reactions; and, apart from hopes of material reward, they, too, can be encouraged to work more effectively and even with enthusiasm by the knowledge that they enjoy community approval.

Reconciling Social Ideals and Methods of Production

Much of the economic development which we enjoy today is due to the vitality and creativeness of that often-criticized group to which Edward and E. W. Knox belonged—the capitalist innovators and builders. One of the central problems of our time is how to maintain the vitality and productiveness of the corporate institutions they have passed on to us—and to do so in an environment where the rewards of enterprise and the fruits of productivity must be more widely shared.

The mixed nature of the economies in which C.S.R. now carries out its functions, and the social objectives to which those economies must be geared and to which C.S.R. must pay regard, pose problems which the two Knoxes and the legislators of their time did not have to tackle. There are now much more difficult problems of balance, of equity and of efficiency, and they are plagued by slogans, politics and special interest. But it would appear that many leaders of insight and experience in political and social matters are coming to believe that, while a considerable measure of public control over the climate and direction of the economy is desirable and will remain, the basic productive function of private capitalism must be encouraged by allowing energetic and able entrepreneurs, whether individuals or corporations, opportunity to gain both material rewards and the approval of society; and that the large measure of personal freedom which is allowed by the capitalist method must also be preserved on broad social grounds.

Thoughts seem to be turning towards this problem of reconciling social ideals like egalitarianism with the coarser yet vital necessities of work and production. On the one hand, the capitalist method of

production in its present and future stages is viewed as reasonably efficient and reasonably just; and, on the other hand, despite some of the possible advantages of centralized and authoritative economic direction, the increased authority of the State is seen as a threat to many of man's convictions and aspirations.

The suggestion is that public policy could, with social advantage, aim to allow the profit motive to energize the productive process by capitalist means and, at the same time, use the forms of social organization required by capitalistic production and the material fruits thereof for the achievement of broad social ends. One of the basic and one of the most socially valuable attributes of individual man is seen in his profit motive—his inherent urge to increase his material standards and status, and to increase also his ability to take time off from production of goods and services for the pursuit of non-material ends, for his family as well as for himself.

It is no longer so fashionable to question the worth or the rightness of those attributes of the bourgeoisie—entrepreneurial drive, the desire to accumulate property, the urge to save and to invest. They are being looked upon once more with favour, even by some moderately left-wing thinkers, for their own sake and as providing a necessary and desirable dynamic to be encouraged by deliberate public policy.

Moreover, the alternative of state socialism is widely rejected—not socialism in much of its basic idealism but socialism as a means of production and method of political organization, with its necessary aggrandizement of the central authority as the source of power and the seat of judgment. State socialism is rejected as contrary to the main stream of Western civilization: contrary to the Hebrew and Christian doctrine of man's personal accountability and to the Greek tradition of liberty as "the soil wherein alone man's imagination and intellect can flourish and bear fruit"; contrary to the strong sense of the worth of individual liberty passed on to us by the descendants of those Northern peoples who took over north-western Europe, including England; contrary also to the whole reinvigorating spirit of the Renaissance and of the Reformation which followed and which, nowhere more strongly than in England, gave great emphasis to the value of private judgment and responsibility.

But man cannot attain his goals solely by his individual efforts, however inspired they may be, for attainment requires social organization. From the example and precept of Rome stems another powerful tributary to the stream of Western civilization, giving us concepts of order and social discipline, respect for law and constitutional authority, and many of the techniques of government

and social organization. Rome rose to become a great power (and other authoritarian societies have shown signs of similar development in contemporary times), but perished from excess of centralized power and multifarious laws and controls, which dried up the springs of growth and progress that lie nowhere but in the individual. The independent Greek city-states collapsed from excessive freedom which became social and political licence and unresolved faction. Thus, on the one hand, undisciplined freedom and, on the other, excess of centralized authority and over-organization alike proved fatal.

There have since been many similar examples to warn us against either extreme and to guide us towards a social and political organization which reconciles freedom, personal responsibility and vitality with law, discipline and authority.[26] These requirements would seem to be met by evolution towards what might be termed a co-operative society. And co-operation is a concurring more by free decision than as a consequence of authoritatively enforced compliance; it is hindered by the stimulation in the community of jealous faction; and it requires the development and acceptance of common goals.

Such a society could give expression to the ideals of those who believe in the social objectives of modern capitalism and in its practical methods while retaining the liberal tradition and many of the ideals of modern socialist thought; and thus could continue, within the traditions of Western civilization, to advance the material, cultural and moral standards of its members.

Some degree of reconciliation of socialist and capitalist ideals and of the practical methods of capitalism has already been effected in the mixed economies of Australia and New Zealand; and, in further developments, the Anglo-Saxon flair for effecting change within continuity of tradition can be relied upon to help ensure that there is no break with the essentials of the Western spirit. Capitalism itself, government, and the general community can each play a part in this evolution. Important roles for government are to ease tensions so that the community is not trying continuously to walk an economic tightrope, to ascertain the economic facts accurately, to engender approval for productivity-raising and for ethical attitudes; and, at the same time, steadfastly to resist resorting to authoritarian methods and solutions. For, as a leading economist, Italy's former President Einaudi, has remarked, "The goal is not the abolition of regulations

[26] The problem of reconciling authority, discipline and centralizing tendencies with vitality and individual freedom and responsibility is also constantly present in the sub-community of the corporation. Corporate aims and policies and a necessary degree of discipline must be maintained without discouraging individualism or initiative and without impairing personal rights, ideals and aspirations.

but the establishment of regulations within which the citizen can act freely."

The Danger of Authoritarianism via the Back Door

There is an undoubtedly complex problem which requires to be solved for the continuation of our economy as a mixed economy and this is the problem of maintaining a balance between the extremes of, on the one hand, excessive freedom or licence and, on the other, over-organization and authoritarianism leading to statism. This problem is unlikely to be solved without insight, determination and a combination of timely action with patience—all based upon awareness of the basic ingredients of free yet organized society and acting through policies which maintain a clear-minded respect for the sometimes opposed requirements of freedom and organization.

It seems that the threat of imbalance will be of greater or less degree depending upon the solutions adopted for our economic problems. It has been agreed that there are economic ills in our community, and that governmental actions and policies of a broad and general nature are desirable in order to influence the economy in particular directions. At present, for instance, it would be desirable to discourage consumption and to encourage saving and investment; and desirable to improve our overseas balances. But deep and fundamental changes in our economies and societies can be wrought, covertly as it were, by a series of official measures aimed mainly to relieve the symptoms of our economic ills. Each measure may perhaps be of minor significance in itself but a series of them are likely to have large cumulative significance. And changes can also be brought upon us as a consequence of government inaction—or government action that is too narrow and too late—against basic causes of economic illness; thus allowing a situation to develop which ultimately requires drastic and urgent measures to prevent collapse on some important front. In such circumstances the remedies are all too likely to follow an authoritarian pattern. In this current era the attainment and continuation of a successful mixed economy require a holding of the balance against the growth of statism—for this is now the danger rather than a return to any *laissez faire* system.

Statism is no longer desired by large parts of our society. It is contrary to our traditions, contrary to the beliefs and wishes of the best minds of our times and contrary also to the beliefs and wishes of the average voter. For the general stream of both intellectual thought and popular political opinion of the present day is opposed to the aggrandizement

of government. Wartime controls, postwar "planning" and the experiences of nationalized industry, in the United Kingdom as well as in Australia, have combined to disillusion many intellectuals who previously believed in the promise held out by socialism; and recently the balance in the philosophical debate on the One and the Many seems to have been restored. The examples of "national socialism" and of the "people's democracies", which at early stages showed features which many people found attractive, make us distrustful of authoritarianism. George Orwell's *Nineteen Eighty-four* was a fantasy but it typified in popular form uneasy feelings about "Big Brother" tendencies in our societies. In Australia voters have several times clearly indicated in national elections and referenda that most of them want neither more socialism nor more centralized government. That this is the pragmatic judgment of the ordinary man is confirmed by the answers to questions asked in the 1955 opinion survey quoted at the end of Chapter 9. This survey revealed that the large majority of Australians was opposed to government ownership of a range of industries and companies. Only very small minorities are in favour of extending government ownership.

But such convictions and any number of examples do not necessarily remove the danger of the surreptitious development of statism. It is most likely to creep upon us, or to be imposed suddenly in a crisis, through economic causes. Its true nature would most likely be unrecognized. Its gradual and insidious imposition would be marked merely by a restriction here, a control there, a number of regulations or new taxes each designed in its immediate purpose to soothe or to remove from sight some manifestation of economic malady that had come to the surface. And before long, perhaps in a few decades, we might find ourselves with an economy and a society whose fundamental nature had changed, and changed in a manner few of us would have chosen had we been able to see the consequences in time and exercise our choice.

The recent introduction of new methods in the administration of import controls is an example of an authoritarian trend opposed to the basic wishes of the majority of the electorate and initiated by a government elected to observe those wishes—so strong are the attractions of authoritarian solutions to governments and officials. "New men and new principles have invaded the field of import control. Fresh zeal and new purpose are evident in the administration. *But those who care for consumer choice and who desire a free economic system as the keystone of our free society, must see the zeal as misdirected and the autocratic principles as alien.*"[27] "The import cuts must do what non-discriminatory financial

and exchange-rate policy should have done—change the scope and nature of Australian production. But under the new regime the changes will be instigated, not by the normal working of the price system, but by direct official control."[28]

And statism is being cultivated in ways even less obvious than in the case of import licensing. Increased taxation on private undertakings (imposed by a government pledged to encourage private and to restrict governmental enterprise) and no taxes at all on governmental undertakings weigh the scales heavily in favour of the governmental sector and, if sustained, must result in the growth of statism and the shrinkage of individual and corporate initiative and enterprise. In a similar way political pressure for the more dubious among localized "national development" projects and governmental activities in business undertakings which operate at an economic loss, and therefore are subsidized at the expense of the community, result in the progressive enlargement of the governmental sector and in increasingly heavy taxation of the private sector to pay for it. A few of such community actions are hard to escape. The danger lies in complacently accepting them as the rule rather than as exceptions which need overwhelming reasons—and no alternatives—to justify them.

Another field in which danger lies is that of wages. The unwise exercise of sectional monopoly power to attain sectional rewards unmatched by productive contribution may not be disastrous (even if indefensible) when confined to relatively small sections of the community. But it can become disastrous when applied to a sector covering half or more of the national income. In a period of full employment (with all its great benefits) the bargaining power of the trade unions is enormously strengthened. The question then indeed becomes "What of responsibility?" If this responsibility is not wisely exercised the community will be forced, for economic survival, to impose controls. And then another major step towards statism will have been taken—essentially unwanted by the community.

As time goes by and problems multiply, we can slide, or be precipitated, into price controls, capital controls and controls over wages and men almost as easily as we slid into the new forms of import control—all imposed under persuasive argument based on the symptoms of the moment and with the smooth explanation that such controls serve the interests of the economy and will not harm the maintenance of a free society.

[27] *Sydney Morning Herald*, 24 July 1956, "End of a Free Era in Australian Import Licensing."

[28] *Sydney Morning Herald*, 25 July 1956, "Crucial Changes in Administering Import Controls."

The underlying causes of those situations which turn thinking towards controls as a solution can be identified in economic crises which should have been forestalled earlier; in jealous faction fed by inaccurate economic data; in the widespread and too often unthinking demand that centralized government should correct every difficulty, fill every deficiency, right every wrong; in the propensity to seek more and more social services by taking from one section to give to another—stemming from an insufficiently-balanced regard for unqualified egalitarianism; in the disregard of the right of the producer to say—and to maintain—that his produce, whether in the form of goods or profits or wages or fees or salaries, is *prima facie* and fundamentally his own, a right which requires to be highly respected and modified less rather than more. When it seems necessary, in the public interest, to impose a tax, to acquire property or otherwise to interfere with the economic freedoms of the citizen, every legislator and every official should say to himself "What is the *least* degree to which I can modify these property-owning rights and other freedoms? If it is necessary that I interfere with them at all I ought to err on the side of interfering less rather than more." And it is important too, that it be done by general rule of law and not by arbitrary direct controls and individual decisions.

We shall take major steps forward as a community if, in the numerous and various places where leadership abides, there is a conscientious, even if difficult, thinking out (for translation into policy) of these propositions: that productive elements in the community require encouragement and stimulation in preference to the consumptive elements; that our basic ideals as a society require for their realization individual and personal and group responsibility; and that such ideals are not compatible with the expectation that government (whether federal, state or local) should solve all our lesser problems and their local manifestations, and also not compatible with continuous attacks on government, instantly and on all fronts, for not solving all problems at once. We could find ourselves in much the same position as Aesop's frogs in the pond who, dissatisfied with their sluggish king, asked Zeus for an active ruler and were given a stork who gobbled them up.

Perhaps the most important defences against the dangers of authoritarianism-by-stealthy-degrees are education about the basic roles of freedom and organization in society, economic education, more accurate economic information, and the acceptance of individual and group responsibility. The tendency to look to government is not compatible with freedom or, in the longer run, with continuous growth and

prosperity, because these stem from the activity and enthusiasm of persons. "Not what is done by a democratic government, but what is done under a democratic government by private agency is really great."[29]

III

CONCLUSION

This account of rewards and contributions will be brought to a close by turning from ideas and broad considerations to concrete facts and evidence, although mainly in the form of some reminders rather than a detailed summary.

Standing out unquestioned amidst all the considerations are the responsibilities of the corporation to operate at a profit and to grow. (Growth in this sense is economic growth, virtually identical with higher productivity. It includes, for instance, obtaining the same level of output with lower inputs of labour and other resources.) To profit and to grow are responsibilities not only to the owners and employees but also to the community, and can be discharged only by successful performance in marketing, in innovation, and in productivity.

In the field of sugar, the cultivation and development of markets and the growth of production to supply them, in recent years as in the more distant past, have been described. Technological improvements in agriculture and in factory production and innovations in various directions have been dealt with. Innovation in the context of the South Pacific, as well as economic growth, is recognizable, too, in the newer activities of the company in building materials and in the chemical industry. In large degree these latest developments have been new to Australia and their establishment has proved as difficult as or even more difficult than the establishment of the sugar industry a hundred years ago. The new products are mostly now firmly established and their output and profitability are likely to improve steadily.

[29] de Tocqueville, quoted by J. S. Mill.

It is a function of corporate capitalism to enterprise, which involves the taking of considered risks. The tempo of C.S.R. affairs has not always been even and there have been some reverses. In the period since the first world war, Homebush and Childers sugar mills in Queensland have been dismantled: Homebush in 1922 after 39 years of operation and Childers in 1933 after 38 years of operation. In both cases the main reason was an insufficient supply of cane for profitable operations. And in both cases the cane transport system was sold cheaply to the adjoining mills to which the Homebush and Childers farmers thereafter sold their cane. These closures were the reverse of instances where C.S.R. had absorbed other sugar businesses (and the closures supported E. W. Knox's concept of valuing such assets in the books "at their value for removal").

Business hazards continue to be real. Two of our small sugar mills even now have very uncertain futures. After twenty years of effort to make a success of the pineapple industry in Fiji, the plantation and cannery had to be closed down in 1955. Some of the important ventures in building materials and chemicals might have failed if a more than ordinary amount of expertise and perseverance had not been put into them.

C.S.R.'s main activities have extended from the production of food in increasing quantities to the production of shelter and other materials for the health, comfort and enjoyment of man. And for better or for worse these activities have been concerned near the source or in the intermediate stages of the production chain, rather than in the consumer-distribution trades or in consumer-finance.

The trend of economic contribution over a hundred years of operations is illustrated, even if in a somewhat crude way, by the following table which shows the physical quantity of goods manufactured by the company at quarter-century intervals in Australia, New Zealand and Fiji. (The figures in each column are for the one year, not for the 25 years.)

Tons of Goods Manufactured by C.S.R. 1855-1955

Year ended 31 March	*1855*	*1880*	*1905*	*1930*	*1955*
Refined sugar	*5,284*	*13,550*	*180,230*	*383,803*	*562,973*
Raw sugar	..	*5,352*	*119,343*	*230,402*	*397,620*
Distillery products	*585*	*250*	*1,415*	*6,600*	*34,176*
Building materials	..	..	..	..	*191,000*
Chemicals	..	..	..	..	*6,000*
(60 per cent of output of C.S.R. Chemicals Pty Ltd.)					

Without leaving the directly economic field there are services and other economic contributions to be added to the tonnage of products manufactured and sold and the question may be asked: who receives the revenues to which the company's enterprise gives rise? The following table shows the proportions in which, for the company's 1955 financial year, various groups, including governments, shared in the total revenue of the enterprise.

	Proportion of Total Sales Revenue
Suppliers of materials	76·5 *per cent*
Suppliers of services, including transport	7·2 ,, ,,
Employees	10·2 ,, ,,
To provide for wearing out of assets	1·5 ,, ,,
Government—various taxes (including excise duty on sugar in New Zealand)	3·0 ,, ,,
Proprietors of company	1·6 ,, ,,
	100·0 ,, ,,

In this chapter functions of the corporation, economic and otherwise, have been referred to. Taking all the considerations together a further question can be asked: has C.S.R. rewarded the societies in which it operates as well as rewarding its owners and employees?

The total physical output (not the value) of all C.S.R.'s manufactured products over one hundred years has been tabulated. Services which cannot be included in such a calculation, such as financing and managing the distribution of sugar crops, have also increased greatly. Some other contributions do not lend themselves to quantitative measurement; these include the successful policies pursued in relation to suppliers of cane and in employer-employee relations; the achievements for the community in Fiji; the company's major role in the sugar industry of New South Wales; its considerable part in the development of the sugar industry in Queensland and, therefore, in the development and economic health of north-eastern Australia; and its developing of a new industry in an empty and desolate part of Western Australia.

Although a few pointers have been given in this brief concluding section, a reminder is also given that the full answer to the question about C.S.R.'s contributions is to be sought in the generality of the evidence and information given in this book.

Editor's Epilogue

A FIRM policy for all contributors to this book was laid down from the beginning when we were asked to "avoid prefabricated conclusions". We were to state the facts and let them speak for themselves; where conclusions were drawn they had to be amply supported but in the main the reader was to be left to make up his own mind. Yet I am aware of some things which have been left unsaid but which are important if the reader is to make valid judgments. If I do depart here from the general policy and draw some conclusions, it is because I feel that this is necessary to complete the picture now that we have presented the facts.

From those facts, supplemented in my own case by the information gained in nearly two years of close association with the company in preparing this book, it is possible and desirable to suggest some general principles about the role of a capitalist corporation such as this in our society. But before doing this it is necessary to attempt some summary of this company's character and quality, for these factors are vital in determining how its power will be applied, just as a teacher's character and sense of responsibility are vital in deciding how his knowledge and influence will be impressed on his students and colleagues.

In C.S.R. tradition plays a part of unusual importance, at least for an Australian company. As we dig below the surface it is increasingly striking how much of that tradition is a heritage from the characters and policies of the Knoxes, father and son. This is a natural consequence of their control of C.S.R. for over 75 years, more than three-quarters of the company's existence. But the fact that during the last 25 years of rapid growth and change, both within and outside the company, those traditions have been carried on, and by men of strong and critical character, is perhaps the best evidence that they were sound.

Both Edward Knox and his son were men with a highly-developed sense of responsibility and clear-cut values of right and wrong. These qualities persist in the dealings of the company. One can find those who will criticize C.S.R. in some direction but I have not yet found anyone who questioned its integrity. I found in Fiji that this quality is most significant in the company's relations with the Indian farmers; even junior officers who were not able to express it so succinctly were aware of it and assessed the desirability of their own actions and of

possible changes in company policy by the effect which they might have on the company's reputation for integrity. From a critical-minded and well-informed leader of the sugar industry in Queensland, who represented interests "on the other side of the fence" from the company, the severest criticism I could get was that it is "as tough as goat's knees, but honest".

The tradition of honesty is scrupulously guarded. Sometimes it has made me impatient as progress with this book was slowed down by checking for the *n*th time some point of detail or interpretation, but I learned to respect the attitude that "we have a reputation for accuracy—our cane farmers, the Sugar Board and our customers all know this—our facts and figures must be right". The tradition of honesty is carried further than the field of facts and figures. In this company there is no unscrupulous outbidding of a smaller competitor for the services of his trained staff. Moral values and loyalty for past services and associations are observed, as exemplified by two sugar mills which are still operating although they have made losses more often than profits in the past 15 years. A major reason for not closing them is that they have been operating for over 70 years and there is a strong feeling of responsibility to the farmers, many of them second and third generation suppliers of cane, with land which would not lend itself to other forms of production if the mills were to close down. The attitude is that "those mills may have to be closed in the end, but let us work patiently with the growers to see if plans can be made and implemented to make them profitable".

The tradition of thrift and hard work, which stems from the Knoxes, appears repeatedly in policies and in the behaviour of individuals. In spite of all the continuous replacement and enlargement of plant, there are many mills and refineries which still operate items of equipment which would long since have been unserviceable with less careful and efficient maintenance. Millions of pounds in the assets have not meant any slackening of care in the use of the pennies. In many places one encounters men who get a good deal of personal satisfaction and pride from the volume of work which is handled in their sections by a surprisingly small staff. The fixing of a departmental head's salary by the size of the staff he builds up is a principle which does not seem likely to intrude here.

The Knoxes were free traders and were strongly opposed to the intrusion of government into commerce and industry. E. W. Knox opposed the Regulation of Sugar Cane Prices Act in Queensland, believing that the company could best arrange just terms between its mills and the growers without the intervention of a government-

appointed authority. The company strenuously resisted government-decreed preferences in employment to trade unionists in Queensland, although it had been foremost in improving conditions and introduced a 48-hour week as early as 1905. Such traditions continue today in outspoken criticism of and suggestions to governments on industrial policy, tariff and import policy, the taxation laws on depreciation allowances for industry, and other major matters. But in all these cases one policy has been consistent—oppose what you think is wrong; negotiate and contest; but if beaten, however wrong you think the law or regulation may be, if it *is* the law, observe it. As one senior officer remarked, "We may not always have been right, but in cases where we have been proved wrong the fact that we opposed was a good thing. In some senses we have been like Her Majesty's Opposition, and ultimate decisions by authority have been the better for having had opposition. In some instances we have been right and sometimes we have won the argument, either immediately or later."

Some of the traditions may make the newcomer smile. Female secretaries and typists were not employed at the head office until about 1936 and not extensively until the start of World War II. There were some advantages in the training of young men by their acting as secretaries to senior officers, and many who are now seniors can recall typing their reports at a mill office long after the normal day's work was done. But there is no doubt that the exclusion of women for so long stemmed from the conservatism of E. W. Knox in this matter.

No member of the staff may smoke in his office in business hours, a rule which I have heard justified by some who suffer by it on the basis that "a little personal discipline is a good thing". One explanation of this custom is that E. W. Knox stated that the "clerks" were no better than his "mechanics" in the mills and refineries and since the latter could not smoke, for reasons of hygiene and safety, the same rule was good enough for the men in the office. The cynics, however, will say with a smile that the reason was simply that "E. W." disapproved of the habit.

There is still the tradition that the doors of executives' offices are always left open—there is the unspoken assertion that no one is seen in secrecy and there is nothing to hide. But the convention of the "open door" has a wider significance: it is intended as an open invitation to all officers to come in and discuss their problems. Even the general manager's door stays open and any officer is entitled to see him on any personal or business matter, almost without notice if he is disengaged.

Such things are minor components contributing towards the creation of an individual, distinct and disciplined character which embodies another tradition—that the company will not follow an opportunist or smart way to gain profits or publicity or sales. Although there is a goodly degree of conservatism stemming from these traditions of dignity, discipline and integrity the company has, nevertheless, frequently been ahead of its contemporaries in many important ways—scientific large-scale methods, relations with employees and suppliers, and technological development. Many improvements in commercial and industrial practices which suddenly come into the limelight with a new name tagged on have been operating long since in the company.

The tradition of the company in its relations with its employees also owes much to the Knoxes. It embodies the simplest principles of good human relations, with loyalty engendered through consideration of the individual, help in his training and personal financial problems, provision for his old age, the encouragement of thrift, and a conscientious study by top management of all matters affecting appointments, transfer and promotions. In short, there is genuine respect for individual men who, in their turn, have developed a basic respect for the aims and methods of the company. These policies are accompanied by the greatest care in selection before employment, particularly in the case of the salaried staff; "the right to hire" is properly treated as being more important than "the right to fire".

There has resulted a morale and an *esprit de corps* of outstanding quality. To the company these are invaluable assets. To the individual they contribute personal strength and satisfactions of great importance, particularly in a world where so many have lost the old sense of belonging to a community, whether to a community of interest in work or to a bigger brotherhood bound together by common social or religious belief and practice. Employment in this company provides, for many men, part of their need to belong to a group whose character satisfies them and wherein they can feel that their efforts are united with others in something of value.

In its relations with the weekly-wage employees the company has done a good deal better than most Australian employers and its policies have produced a good record of freedom from strikes. But it is, at the same time, clearly aware of and dissatisfied with the extent to which better relations are hindered by many strong forces, including the tendency to promote points of difference between employer and employee and to destroy the belief in a common interest and the pursuit of common goals. A sense of responsibility, equally as much as the imperatives of profitability in an industry of very small profit

margins, has caused the company's policy of rarely exceeding industrial award conditions, even under the stress of competition for labour during recent years of overfull employment.

At first glance the company may appear to have been slow in applying techniques of personnel management which place emphasis on the individual care and guidance of the employee by specialist officers. It has adhered to the belief that responsibility for the men in their charge should rest squarely on the managers. In recent years experiments have been made in some of its factories by the appointment of personnel managers with responsibilities largely separated from the normal functions of administering industrial laws and awards, and the results of such steps are being closely observed. If changes do come, because of the increasing burden on the shoulders of managers in the line of command and the lesser time which they have for personal contact, the changes will be made not hurriedly and not because they are fashionable but only when they have been thoroughly tried and tested.

Such comments about the influence of the past on the character of the company today are significant when considering the motives and methods likely to be employed in its operations. Equally important is the nature of the group management system which has replaced the control by one man of the early years.

The group management of big corporations has received much attention and study in the United States, where it has developed greatly in the last 25 years. Writers there have commented on the fact that these new managers see clearly the responsibilities of the big company, that they are more aware of public opinion, that they are using more refined techniques of analysis and prediction in their gauging of markets, material requirements and new fields of development, and that they are particularly concerned with the future. All of these things seem to me to be largely true of C.S.R., although the changes have not been so great in this case because the managerial group took over the creation of a father and a son who were, in many ways, generations ahead of their times in commercial and managerial outlook.

This managerial group in C.S.R. extends further than half a dozen men at the top, although it is they who must set and maintain standards, who must make major policy recommendations to the board, and who must maintain continuously the supervision and direction which ensure that decisions are implemented. Working with them, however, are the many commercial, technical and production specialists who plan and supervise all the diverse operations. As one leading figure

in the Queensland sugar industry put it to me, "There is a mighty big variety and strength of personal skill and knowledge at number 1, O'Connell Street. We in the industry know that when C.S.R. speaks a lot of good men have made their contribution. This is their great strength. They haven't had to back-track too often."

I have seen this system at work with up to a dozen senior men discussing some major programme, exchanging views and supplying information, and one of them then committing the consensus of opinion to writing. So that there can be no doubt that all are clear on the matter, the resulting memorandum is initialled by those who contributed and it is ready as a clear instrument for submission to the general manager or the board for final approval. Copies will then be distributed to others who should be informed. Such a system might be expected, by virtue of the number of people involved and the deliberative nature of arriving at finality, to run the risk of being slow, especially when the field to be covered is so wide and big issues arise not only in keeping the wheels moving but also in expanding and developing into new fields. I can understand my Queensland friend who commented on the management system of the company that "it may not always produce quick action, but it does produce an awful lot of wisdom". But there have been occasions when the company's quickness of action has taken aback other parts of the sugar industry and I have seen ample evidence that where speed is important the system can produce quick results. The key to the situation seems to lie in the way that priorities are established and in the quality of the men in the management group, where a rigorous standard of individual performance and sense of responsibility prevails.

Here, in the quality and sense of purpose of men, lies the asset which does not appear in any balance sheet but which means so much in achieving greater or more efficient production and real gains in our standards of living. The company which has built such an organization over many years has an asset which cannot be readily created, and it is an asset not only for itself but also for the nation.

I have seen in this managerial group in C.S.R. a lively awareness of the importance of political and public opinion and a deep concern about the role of their corporation. No less than the founders of the company, they have a great devotion to it and a firm belief in the value of what they are doing. While alert to the social implications of their company's actions, they do not forget the results which must be achieved for their ultimate employers, the twelve thousand shareholders.

The reader will now have decided whether this capitalist corporation is efficient and progressive, whether it has paid respect to non-material

aspects of our civilization while contributing to increases in our material standards of living, and whether its management is likely to act responsibly in the wider sense. There are still a few other aspects on which some readers will make their judgments; these lie mainly in the political and social field, where rational and scientific judgment is rare and difficult and where the individual's personal background or experience may greatly influence his conclusions.

One such matter is the question of C.S.R.'s so-called "monopoly". This has been examined in various parts of the text and it seems reasonable to conclude that there would be little justification in the future for using this description without regard to its correct economic definition and the extent to which, if at all, it is properly applicable to part of the company's operations. The application to the company of the word "monopoly" in even the loosest and more colloquial sense, and this is the one most frequently used in political and industrial argument, will not generally bear close scrutiny. Where it is so applicable, as to milling in Fiji or refining in New Zealand, any disadvantages to the community seem rather obscure, whereas evidence has been presented concerning the efficiency and the very positive advantages for all parties. The honest critic will have to refurbish his weapons and perhaps throw away most of those which he has inherited from the armoury of the political debates of fifty years ago before attacking too recklessly on this score in the future.

The only other line of further query that I know relates to "bigness" and "economic power". These are aspects where opposition is not always clearly defined, but doubts about the desirability of large concentrations of wealth and power in the hands of big organizations, whether capitalist corporations or government departments, do influence the judgments of some people. For example, there are many in Australia who are always ready to condemn profits which are big in total, regardless of the capital which is employed in earning them; some people would deny to the big organization the right to gain a reward for innovation and risk-taking, although relatively similar rewards would not be questioned for some small manufacturer of gadgets or some opportunist importer of baubles.

In the United States of America, where the growth of big corporations has been very spectacular, this dislike of bigness has led to repeated demands from some quarters for the encouragement of small and new businesses, and for efforts to restrict large businesses, business groups, and trade unions. It is interesting to note that in the United States, according to a recent article in *Fortune*, one out of four business employees is working for the 200 largest corporations. On the other

hand, there is an opposite attitude which is more clear-cut and acknowledged in the United States than here and this is the respect for accomplishment. This is coupled with the realization that in many fields of endeavour success breeds size and that it is size which supports the big research departments, attracts and develops the highest level of management, allows overhead costs to be spread more widely, and promotes stability and security.

Although by American or United Kingdom standards C.S.R. is not a really big company, this is the type of advantage which is enjoyed by it; which has made possible expansion into new fields when its basic interests became somewhat restricted by the sugar market situation; which supports its large research organization; which has allowed it to attract and enter into partnerships with some of the big overseas manufacturers whereby it gained access to advanced chemical and technical knowledge; and which in one case resulted in the introduction of considerable overseas capital which is now allied with Australian capital and predominantly Australian traditions. These are achievements which have a significance and value extending beyond the direct interests of the company itself, for they are illustrations of courses which will be followed increasingly as Australia progresses towards greater use of her potential for economic and population growth. In such ways C.S.R. plays a role, along with other big business, as a pace-setter for the Australian economy.

It has also been these qualities of bigness and strength which have made it possible to extend into new ventures involving calculated risks on a scale which would have been too large for smaller companies. Recent expansion into a new chemical field, into asbestos mining, and into certain phases of manufacture of building materials, have all been major pioneering ventures in Australian industry and in some cases they are still attended with poor financial results. But they have been basically sound and major developments with a considerable measure of national value. The organization is big enough and strong enough to carry on with them until their value is clear.

There is another field where the importance of bigness must also be acknowledged and this should be done not grudgingly, but gladly. There is no doubt that the strength of the great corporations of the United States, not merely in physical and financial terms but also in the quality and variety of the technical and executive brains which they had trained and employed, provided the answer to the great challenge of achieving the staggering production requirements of war. Big industry, unaided by government and at no cost to the national exchequer, is continually building and developing resources of material

and brains which represent security factors of incalculable importance for the nation, and particularly here in Australia at a critical stage of vulnerability and relative numerical weakness. This is an aspect, seldom spoken of or recognized, which should not be lightly ignored.

The sociologist may inquire further into the reasons for suspicion of "bigness" and find a variety of causations, some based on religious beliefs but others compounded of baser human characteristics such as jealousy, envy and ignorance. This is no easy field in which to give glib answers. But one can pose some questions to try to get clearer thinking about what is meant by "bigness" and to place the subject in better perspective. We might start by inquiring just what bigness means in numerical terms. C.S.R. employs 10,000 people, has 12,000 shareholders and processes the cane of 13,000 farmers. What do these figures mean in the context of a total population of Australia, New Zealand and Fiji of nearly 12,000,000 and compared with other aggregations of power such as the Australian Workers' Union with approximately 180,000 members, the Waterside Workers' Federation of Australia with 27,000 members and the Postmaster-General's Department in Australia with 77,600 employees? The company's assets are stated at about £54,000,000, its annual sales have now passed £90,000,000 and its dividends and bonuses in the centenary year were nearly £1,700,000. Are these big sums in the context of a gross national product for Australia of £4,832,000,000? Even in those things which appear big, the profit is shared by the many, the assets belong to the many, and the large number of employees seem to be reasonably satisfied and they are accorded respect.

With regard to the fears of those who suspect concentrations of economic power, whether of private corporations or governmental authorities, the latter backed, too, by political power, there are also a few questions to be posed. One way to consider them, as power is the key word, is to examine how far the power is untrammelled and what are the checks and balances. The information in this book combined with our everyday knowledge of government, trade union and business affairs will help us to consider these questions in perspective. Moreover, someone, some institutions, some groupings, will always be exercising degrees of power in our societies. Important aspects come to mind: How, in fact, is the power being exercised? Who, in truth, exercises it, for in companies like C.S.R. the decisions are not made by one man or even by a few? Would others exercise it better? Who would be the alternative wielders of power and what would be their motivations? If one grouping of power be diminished it would become easier for other groups to increase the exercise of

their power—who would gain in power and would we approve? It is as well to remember that in the realities of life some institutions are criticized mainly because they stand in the way of increases of authority for some other group.

These are involved issues about which debate will continue for a long time, especially in the intellectual community which has tended to be more critical of business and of the capitalist system of production than has the more pragmatical man in the street. This is not the place to explore the reasons for the attitude of the intellectual. But it is interesting to recall that the evidence available on public opinion, as given in Chapter 9, indicates that the ordinary public thinks highly of C.S.R. and of other prominent companies in Australia. The public is certainly not as unfriendly to those companies as a small minority proclaims and as a few politicians seem to think.

How do the men of the managerial group of C.S.R. see the role of corporate capitalism in this mid-twentieth century? Several of them have contributed their ideas to this book, not in theoretical abstractions but in the context of what they are doing and how they do it. Sir Edward Knox, the chairman of the board, has referred to these matters in the Introduction. One of the senior officers has summarized the position as he sees it and I quote from one of his memoranda:

Of the profit function he says:

> A fundamental object of the company is to make good profits for its many shareholders. Profit must be the arbiter: it is the practical measure of social utility. If policies and ventures are not monetarily profitable—in the longer run, if not in the shorter—they have no future and must die. It may be possible to keep an unprofitable enterprise going for sociological or national reasons for a time (which we have done) but not in the long run.

And of the social function of the corporation:

> The primary social responsibility and function of the privately-owned, capitalist system is to produce. The business system, while it is increasing the material welfare of the masses and improving its own working ethics, is directly making it possible for a steadily-increasing proportion of the people to enjoy higher standards of culture and also, it would seem, of ethics. In past societies where productivity was low only the few could enjoy any real freedom from the struggle to provide for the material necessities. But the high productivity of modern industrial capitalism provides the material basis which facilitates a far more widespread participation in and regard for non-material things.

These are clear words which show a straightforward realization of the materialistic facts and indicate that the senior people concerned with the direction of the company's affairs draw strength from the belief that the capitalist corporation performs a valuable function in contributing, even if indirectly, to the highest aspects of society. The reader of this book will have found the facts by which to judge such motives and their implementation. The record may give pause to some sincere sceptics who have made up their minds on scanty information or who have inherited prejudices and slogans but who can now assess the company on the basis of facts. In the long run the facts will have their influence with the electors who are called upon, every few years, to decide on political courses which shape our business and social structure and which influence profoundly our own future living standards and those of our children.

The bigger issues, such as the status of our country in international affairs, the assistance and guidance we can give to our Asian neighbours, the amount of the national income we can devote to defence purposes, the aid we can expect in time of trouble as a self-respecting and reasonably self-reliant and vigorous country, indeed our security in the not too distant future, all point to the need for a higher rate of increase in productivity, combined with reasonable stability. The success of companies such as this in making their most substantial contribution to productivity and to our technical and all-round strength will be an important factor in deciding those issues.

A. G. LOWNDES

August 1956.

Notes on Some Effects of Inflation, Taxation and Direct Controls

July 1956

These notes by Mr J. M. Dixon expand and further explain some matters raised in Chapter 15, The Rewards of Enterprise, *particularly in section II of that chapter,* Corporate Capitalism in a Mixed Economy.

* * *

The rate of increase of material welfare in Australia has been considerably slower than in a number of other advanced countries. Some of the reasons for this slow rate of progress have been discussed generally in Chapter 15 and Appendix 33, and there are some important contributory causes which are given closer attention in these notes: inflation and inadequate accounting for inflation; fiscal and taxation measures and controls which ignore inflation and inhibit economic growth by raising costs and making investment in many productivity-raising steps unprofitable.

After much consideration the conclusion was reached that these notes are a necessary exposition and elaboration of major problems affecting corporate capitalism in the mid-twentieth century, especially for those readers who wish to check on some of the underlying and some of the more technical aspects of the situation.

It cannot, perhaps, be claimed that all causes and effects of slow material progress, inflation and so on are identical for the average Australian, the average company and C.S.R. It can, however, be claimed that there are many causes and effects that are common to the community and to companies; that if good for one are good for the other and if bad for one are bad for the other; that, to a very large extent indeed, economic health is indivisible.

The notes are in four main parts:

1. MEASURING REALITIES IN A PERIOD OF UNSTABLE MONEY

Introduction; the inflationary situation; honest stewardship and inaccurate yardsticks; the nature of the problem of accounting for inflation; some effects of inflation on saving and investment; C.S.R.'s interest in problems arising from inflation; some further opinions and actions on accounting for inflation; the level of national savings; wage fixation and negotiation.

2. SOME EFFECTS OF HIGH TAXATION OF COMPANIES

Double taxation of public companies' profits; company tax a cost of production inhibiting productivity; effects of inflation on taxation of company profits; the taxing of governmental and co-operative businesses; company taxation—conclusion.

3. THE LITTLE-KNOWN LOW LEVEL OF COMPANY PROFITS

Company profits and the national income; real returns to shareholders from a sample of company enterprise.

4. PRICE CONTROL AND OTHER DIRECT CONTROLS

These notes are not all-embracing; there are further aspects. Also, they do not follow all the points raised as far as they could be pursued. It is hoped that others may be stimulated to further study of these questions, which are of practical importance. And it has not proved possible to keep the various subjects entirely segregated under the respective headings because the problems are inter-acting.

1. MEASURING REALITIES IN A PERIOD OF UNSTABLE MONEY

Introduction

Engineering, all will agree, has proved itself a remarkable means for promotion of the material progress of the world. Engineering's achievements result from the intense and continuous application of science. In the application of theory to produce practical results the success of engineering, as of science and technology generally, lies essentially in *measurement*—more measurement and measurement of greater accuracy. An engineer can measure the amount of energy in coal and the proportion of that energy lost in combustion, in transit and in turning the wheels of engines. The engineer thinks in terms of the quality of the coal: not every ton of coal is the same, worth the same, capable of producing the same results. Engineers have produced devices and techniques to measure length, weight, heat potential, conductivity and so on; and have also evolved methods of making accurate allowance for change or distortion due to varying conditions of temperature, pressure and other factors.

The accountant and, to a considerable extent, the economist—and therefore governments, businessmen and other members of the public who work from their findings—use money as the principal measuring-rod. And this yardstick is used without application of any standard practice for measuring the quality of the money or of how much, as a yardstick, the money is shrinking or stretching. The engineer would not use an elastic tape measure; moreover he would allow for the effect of temperature in expanding or contracting his metal measuring scale when making delicate and important measurements.

Without some reasonably effective and consistently applied method of adjustment to take care of the varying quality of money as an economic and financial measuring device, applied science can hardly be said to operate. Therefore we are not obtaining in our national and business economics the real benefits, or anything approaching the full benefits, of the scientific method.

Habit and tradition, political convenience and the vested interest in inflation held by some parties appear to be the reasons why these vital principles of science are not paralleled in the field of accountancy. Their application in accountancy might fairly be claimed to be of at least as great importance as the use of similar principles in other fields, because accountancy, with its constant flow of reports to all sections of the community, is intended

to provide facts and indicators about every activity aimed at maintaining and improving the community's material well-being.

In the sphere of national accounting the United Kingdom Government (and some other governments) has recognized the necessity for making adjustments for inflation. The United Kingdom has improved accuracy in its national income estimates by recognizing the need for adjustment of stock values and of depreciation to allow for inflation. Some of the annual United Kingdom statistics are recalculated in terms of constant prices. It is worthy of note that the lead in practice has been mainly given by governments and governmental instrumentalities, guided by men with high-level training in economics and statistics, in the United Kingdom and elsewhere (but not in Australia or New Zealand).[1] In recent years some accountants and economists have evolved techniques for measuring business and economic realities in a period of unstable money and it is to be hoped that these will have increasing application.

The Inflationary Situation

In material matters, inflation is perhaps the factor which, above all others, readily unleashes man's capacity for excessive optimism, wishful thinking, confused thought and subsequent wrong action. With costs, prices and figure-incomes spiralling, the most experienced of men find themselves losing their grasp of fundamental realities; unable to carry out their responsibilities with a satisfying degree of reliability; unable to exercise normal disciplines over those around them and unable to play a purposeful and effective part in community arrangements. The constantly mounting figures required to record sales, wages, profits, asset values and taxable incomes induce an atmosphere of growth and prosperity and generate psychological attitudes quite divorced from the material realities which the figures are intended to express.

The habit of thinking in terms of money, which is tremendously quick and convenient, and reliable in periods of stable money, carries on into periods when the value of money is unstable. We do not stop to take enough notice of the change in our unit of measurement. Production results, income results, quantities of resources and many other factors are, for quite a time, thought to be bigger and better simply because they show up as a larger number of monetary units. Such is the force of the money habit that these thoughts can continue for a long period without sufficient regard being given to the possibility that production, real incomes, real resources, far from increasing, could actually be stagnant or declining. At the very least, whatever growth is occurring is pitched at a much more gentle slope than that projected in the minds of the thinkers, not to mention the non-thinkers.

Only after a considerable period is it brought home to thinking members of the community that living standards, real quantities of resources and productive capacities do not depend upon the numbers of monetary units put into the pay envelopes or recorded in books and profit statements, but upon the production capacities of our physical assets, the efficiency of our workers and the capability of our managers.

There is a considerable degree of correspondence between the inflationary situations in recent years in the United Kingdom, Australia and New Zealand. In 1956 the United Kingdom Treasury and the Central Office of Information published a popular version of the White Paper, *The Economic Implications of Full Employment.* This says, "It is not every rise in incomes which sends up prices. It is when incomes rise faster than output that prices rise"; and later, "Earnings have risen much more than output-per-man. So labour costs per article have risen about 30%" (from 1950 to 1955).[2] *The solution the United Kingdom official pamphlet looks to is (a) higher productivity, together with (b) restraint in attempting to raise incomes of all kinds other than as a result of higher real output.*

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[1] See below, *Some Further Opinions and Actions on Accounting for Inflation.*

[2] Regrettably, similar statistical comparisons are not available for Australia. The only Australian indices of productivity, including output per man, known to us (except by working from the national income as in Appendix 33) are incomplete and far from comprehensive.

This, it will be noted, puts emphasis on more production as well as on restraining increases in monetary incomes and expenditure. Discussion in Australia has placed singularly little emphasis on the first and the positive aspect—singularly, because increased production is capable of raising living standards in addition to countering inflation.

The White Paper makes these observations:

> We must guard against the false sense of internal prosperity that can be given by continually rising money incomes unaccompanied by the necessary levels of output and exports, which cannot last and must ultimately endanger our long-term prosperity, and with it the whole ideal of full employment as a feature of our national economy.
>
> How fast output rises depends on our success in raising productivity. The achievement of a sustained increase in productivity calls for contributions from both management and labour. Management must strive to ensure the maximum expansion of output by progressive investment in the most efficient capital assets, by the introduction of the most modern industrial techniques and by the elimination of all restrictive practices which inhibit the economic growth of production. The contribution of labour lies in co-operating to the full in the adoption of new methods of working and in setting aside all practices which, however much they may have been justified in the past as means of safeguarding status, conditions of work, or the security of employment itself, are not appropriate in conditions of full employment.

It is difficult enough at any time to sufficiently encourage productive investment and technological progress, to discourage restrictive practices, and to encourage co-operation between labour and management in the utilization of productive resources. But in a period of money inflation it is still more difficult without signs, mileposts and guideposts—without accurate knowledge of the true economic situation and trends. Indeed ignorance and inaccurate information can themselves be the cause of wrong policies and the cause of strained social relations. These points will be further examined.

Honest Stewardship and Inaccurate Yardsticks

Redistribution of the national income, taxation, wage fixation and policies to increase productivity would probably have taken different courses and had a different incidence on sections of the community if authorities of various kinds, from governments and their instrumentalities to arbitration courts, had had more accurate guides to the true facts as to profits, capital, production and wages and had so been led to more accurate methods of measuring the effects of what they were proposing to do. They knew only vaguely and inaccurately because they did not—in fact, could not, from existing data—allow in their thinking for the effects of inflation and for trends that inflation hid. The trade unions—in a strong bargaining position—insisted, successfully in the main, on a continuation of inflation-compensating wage adjustments. (Unions also obtained still further wage increases and shorter hours, which, not being matched by greater output and being an integral part of the greatest cost factor in the community, have had extremely inflationary effects.) The business community and its technical advisers, accountants and, in part, economists, did not likewise effect adjustments. For long, indeed, many could not take their thinking past mere money terms and realize their own position. Confusion of thought and action has arisen because invariably profits, dividends, wages and other matters have been stated misleadingly and compared with one another in money sums of different values—to the continued disadvantage of shareholders, of enterprise and of clear information on many affairs of importance to the community.

The argument here is not directed to the contention that adjustments of wages for inflation—this amount of compensation to wage-earners for inflation—were, or are, necessarily wrong. But applied sectionally these adjustments become a surreptitious way of using inflation to adjust sectional shares of the national income, to the gain of some sections and at the expense of others. These adjustments and the consequences of them have therefore tended to create stealthy transfers; and tended to enhance the development in some quarters of "vested" interests (albeit short-sighted ones) in continuing inflation, extending to some businesses which are assisted by the spending of the higher money incomes.

If there were a comprehensive accounting for inflation[3] almost everyone would realize quickly, and with inescapable impact, what was happening. All would see the results and effective steps would almost certainly be taken against basic causes. The more accurate knowledge and the light thrown upon inflation-caused disparities would help towards actions to remove some of the more potent causes of continuing inflation, as well as some of the causes of social unrest.

Society, not merely business, is in need of new accounting methods to handle accounting in a period of inflation, which it appears will continue to be with us even if not in such a severe form as recently. Without the acceptance of more accurate yardsticks (already known and available) accurate stewardship, in business affairs, in production and distribution, in the economic and social affairs of the nation, is not practicable.

A quick and comprehensive change-over to accounting for inflation would be a lot to expect, but some moves have been made. Each further step is an advance towards better social and economic stewardship and towards progress in its broad sense.

The remarks in these notes about historical-money accountancy are not an attack upon the profession of accountancy any more than the remarks upon the slow growth of national productivity are an attack upon business management. The writer is, however, of the opinion that there will be nothing gained and much lost by withholding a clear and even forthright exposition of the problem. The fact is that leading accountancy bodies, especially in the United Kingdom, have already exhorted accountants to apply new techniques. The medical profession does not decline to take what practical steps it can to relieve cancer because it has not a complete explanation of all its causes and a complete cure for all cases; nor because the steps are unusual and more complex.

The writer acknowledges the genuineness of the traditional attitude of mind of some accountants that they have discharged their professional responsibilities when they have accounted for financial events merely in terms of monetary units. He must, however, express the hope that accountancy will acquire a deeper consciousness of the important gap which must remain unbridged so long as accountancy extends its responsibilities no further than the limits of existing traditions.

In these notes there will be found some exposition of the problem of accounting for inflation and of the far-reaching and damaging consequences of not accounting for it. With the problems of unemployment and cyclical depression solved the great economic problem facing the twentieth century is the solving of the problem of inflation in a period of full employment. The appeal is to the professional accountants to find and apply the solution before the community in exasperation or desperation turns to some other profession or body of experts.

It is most unlikely that adequate cures for inflation will be found and applied until inflation is detected, measured and accounted for comprehensively and quickly wherever and whenever it occurs. It is most desirable that this function be carried out at the professional level with the imprimatur that the accountancy profession can confer upon the results.

Finally, the author acknowledges that exhortation may be easier than practice, but believes nevertheless that a comprehensive accounting for inflation is not really more difficult than many of the calculations and other steps that accountants regularly practise.

The Nature of the Problem of Accounting for Inflation

Although there are certain points concerning which accountants alone are best situated to develop and establish acceptable rules and principles, the nature of the problem of accounting for income (profit and loss) can be posed simply and the *broad* lines of the solution can be presented easily.

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[3] To *account* for inflation is to measure and record its effects and to present true information. This does not, in itself, necessarily or comprehensively *compensate* individuals, businesses, groups or the nation for inflation. To account accurately for business losses is not to remove the losses but it is a very necessary step towards finding the way to counteract the losses.

But before proceeding to discuss the solution let us note three of the basic questions to which we require answers:

(i) What is real profit and how should it be computed?

(ii) What is the relation (percentagewise) between real profit and the real wealth employed in earning it?

(iii) What is the difference between real profit for one period and real profit for another period?

The questions are easy of comprehension but, in a period of changing money values, the development of answers requires thought and an understanding of fundamental principles.

The answers to (ii) and (iii) can be given fairly shortly once we have the right answer to the first question.

Most people, including accountants, speak of profit and think of profit as being the excess of earnings over expenses incurred in making those earnings. There is nothing wrong with this. Accountancy, however, goes further and says that the profit so computed must be capable of being located in measured amounts in the financial events of the period. It must be established that a man's profit as so computed will be what he has "consumed" or spent on himself for the period plus the excess (or minus the deficiency) of the amount of wealth which he has left at the end of the period relative to the amount he had at the beginning of the period.

In other words, accountants say that you can measure profit either (a) by calculating the excess of earnings over expenses, or (b) by taking what a man has spent on himself for the period and adding what he has saved for that period or deducting what he has spent in the period out of past savings. Accountancy, in fact, does it both ways because accountants must ensure that their answer is right.

These accountancy principles are unimpeachable. Accountancy only goes wrong by failing to give effect to changes in the measuring power of its yardstick, the £.

Take the case of a man who commences the year with assets worth £10,000 and concludes the year with assets worth £12,000 and assume the record shows that that person has spent £1,000 on his own living arrangements during the year. Accountancy says he has made a profit of £3,000. This is the sum of the £1,000 spent and the £2,000 saved.

This treatment of the matter, however, becomes inadequate in a period of inflation (or of deflation). In a period of inflation the £12,000 of wealth at the end of the period may in truth be worth less than or more than or be the same as the £10,000 of wealth at the commencement of the period—depending on the degree of inflation.

If the cost of things in general has risen during the year by 20 per cent, then this man would require to be possessed of wealth worth £12,000 at the end of the year to be as well off as he was at the beginning of the year when his wealth, measured by a stronger unit of measurement, was recorded at £10,000. The wealth of £12,000 which in fact he has at the end of the year is (in terms of £s of end-of-the-year purchasing power) the same as the £12,000 of wealth which, when measured in £s of the same strength, he had at the beginning. This man, being no better off and no worse off at the end of the year than he was at the beginning, must be held to have made no profit at all up to this stage of the calculation. But as he did withdraw from his wealth and spend £1,000 on himself we are truly entitled to say that his profit for the year was £1,000. This has to be contrasted with the findings of orthodox accountancy that he made a profit of £3,000. Orthodox accountancy is surely wrong.

The orthodox result of historical-money accountancy—placed before management, presented to shareholders, publicized in the press for the consumption of workers, public servants, politicians, judges of the arbitration courts, income tax and price control officials and others—misleads the community and its leaders and legislators, promotes faction and, worst of all, hides the facts on which alone right judgments and right steps can be based.

Some exposition is required to show the *general nature* of the procedure that will provide a solution.

The first question is how to compute real profit. We have already noted that profit can be computed simply by taking together the amount which a person spends on himself during the year and the amount of his savings (or reduction in savings) during the year. It is simple enough in principle, and correct, to compute a businessman's income, as well as an individual's, in this manner and at the same time to pay regard to any shrinkage of the measuring power of the £ during the year. Here is an example (slightly adapted with the author's approval) by A. R. Mutton:[4]

> During the year ended 30 June 1950 the cost of living, the cost of the things we want out of life, the price level generally, rose by 10 per cent—that is, the value of money declined by 9 per cent. A shirt merchant commenced the year with capital of £10,000 wholly represented by 10,000 shirts which had cost him and which were still worth 20*s* each. He finished the year with a capital of £11,000 wholly represented by 10,000 shirts which had cost him and were still worth 22*s* each. He made no drawings from his business during the year. According to accountancy, his capital was £10,000 at the beginning of the year and £11,000 at the end of the year and the difference of £1,000 represented his profit for the year. The Prices Branch and the Taxation Department—and, in most cases, the merchant himself—accepted that finding as correct.
>
> The merchant, therefore, pays his income tax and pays his living expenses according to standards of people who earn incomes of £1,000 a year. Tax of £100 and living expenses of £800 make a total of £900 which the merchant can provide only by either reducing his stock of shirts or raising a bank overdraft. He cannot maintain his service to the community or his own prospects for earning income in the future if he reduces his stock of shirts. Therefore he "goes £900 into the red" with his banker. At the end of another inflationary year he still has no more than 10,000 shirts and an overdraft of £1,800. At the end of three years the overdraft is £2,700 and, if this process continues, he must inevitably go out of business *despite the fact that accountancy says he is making a net income and living within it.*
>
> The question which accountancy is asked to answer appears to be: "Is £11,000 worth of shirts at June 1950 better or worse than £10,000 worth of shirts at June 1949?"
>
> Accountancy says: "Yes, £1,000 better because the number 11,000 is 1,000 higher than the number 10,000."
>
> Economists, some accountants and other critics of historical-money accountancy say that this question and answer are completely unrealistic. The real question, they assert, is "Are 10,000 shirts worth of capital in 1950 better or worse than 10,000 shirts worth of capital in 1949—the shirts being the same size and quality?" The increase of 10 per cent in the value of each shirt has been neither more nor less than the increase of 10 per cent in the cost of things in general. Therefore, the real exchange value of the total stock of shirts in relation to things in general is neither more nor less than it was a year earlier. The final and correct answer appears to be, therefore, "10,000 shirts at June 1950 are no better and no worse than 10,000 shirts at June 1949—not even a button."

To say that this merchant has made £1,000 profit for the year, is therefore, to say something that is simply wrong.

The same conclusion must be reached if we follow accountancy's other procedure (probably the more familiar one) of determining profit by ascertaining the excess of earnings over

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[4] See "What is Capital Erosion?", *Rydge's Business Journal*, 1 May 1952.

expense (by preparing a statement of profit and loss). This is what historical-money accountancy does:

	£
Initial stock of 10,000 shirts at 20*s*	10,000
Add Purchases of 30,000 shirts at various prices ..	33,000
	43,000
Deduct final stock of 10,000 shirts at 22*s*	11,000
Giving cost of shirts sold as	32,000
Sales—30,000 shirts at various prices	35,000
Leaving	3,000
Deduct expenses	2,000
Leaving accountancy profit of	1,000

This £1,000 profit confirms the correctness (in historical-money accountancy) of the £1,000 profit arrived at by accountancy through the change in the capital position, as shown earlier.

This treatment of the figures, however, defies the principle of elementary arithmetic that you cannot add or subtract like and unlike things. If you do, the answer does not mean anything. In this case we have Purchases, Sales and Expenses all stated in £'s which, on average, are about middle-of-the-year £'s. The opening stock, however, is stated in beginning-of-the-year £'s and the closing stock in end-of-the-year £'s. The adding together and subtracting of these several classes of £'s can only provide an answer which does not mean anything. The statement says no more than this: "This is what the profit *would have been* if, contrary to truth, all the £'s were the same."

The change in the value of the £ between the dates of purchase and sale brings about the position that each £ in the "cost of shirts sold" is older and stronger than each £ in "sales". Failure to have regard to this difference in £'s results in the profit being overstated by £1,000. The correction of this error brings the final result of the profit and loss statement to a profit of *nil*. This, naturally enough, agrees with the real result already arrived at by measuring the profit through the movement of capital.

The tax the merchant has to pay therefore becomes a tax on his original capital or wealth—not on his income, which does not exist, although it is supposed to be an income tax. And he also has to live on his capital. Real wealth and productive resources are reduced.

The example of the shirts explains what happens in respect of working stocks of goods which turn over fairly quickly in the business world. The shirts are "used up" by the trader in his business and quickly replaced. The problem with other assets, such as plant and machinery, used up more slowly in the course of trade and industry, is fundamentally the same, despite some apparent or superficial differences. Because accounting for many important purposes, such as official statistics, taxation and arriving at profits for shareholders, is usually carried out at yearly intervals, and because the plant and machinery last longer than a year, much of the plant and machinery there at the end of the year was there at the beginning. But it is not the same plant and machinery in real value or intrinsic economic worth because the plant and machinery are now partly worn out, nearer to having to be replaced; they are "depreciated". The business world makes allowance for this, based on experience of how long each type of plant can be expected to last, by charging against the year's operations the estimated cost of the year's "depreciation". Depreciation is a very real cost to business and to the community and is becoming a more and more important cost as we advance from primitive methods and manual labour to more and more "mechanical slaves".

Here is an example of what happens in a period of inflation when depreciation is calculated from the original cost in terms of historical money only:[5]

> Smith started business as a carrier about five years ago with £1,000 used to purchase a truck. He provided for depreciation (and replacement) at the taxation rate of 15 per cent per annum on the historical-money cost and reducing balance. He withdrew from the business the profit left after making provision of these annual sums. The truck now requires replacement and can be sold for its written-down value; he has, therefore, £1,000 for the purpose.
>
> Smith finds, however, that because of *general* inflation, a new lorry of the same capacity will cost £1,500. . . . Smith is therefore forced to buy a smaller lorry which will perform less carrying, unless he borrows £500. In either event, Smith has lost real capital, now possessing either a smaller unit of plant capable of less productive work or a two-thirds interest in a unit of the same capacity as he previously owned in full.

It is fundamental to true assessments of real net income of individuals, of businesses and of the nation that adequate allowance must be made for all goods and assets (working stocks and fixed assets) used up during the period. It should be quite obvious than an adequate allowance for the "using-up" cannot be made in a period of changing money values by reference to original monetary cost, generally referred to as the historical-money cost, or the historical cost.

The principle used in the simple illustration of the shirts holds good for capital invested in debtors, loans, cash and any other asset which is normally recorded in a balance sheet in £s of the vintage existing at the balance sheet date. The position becomes a little more complex when we turn to plant and machinery and those other assets which, like the truck, have lives extending beyond a year, and are conventionally recorded in a present balance sheet in £s of a vintage some years earlier. The manner of computing real profit in those cases has been illustrated in various writings by those accountants and economists who clearly see the need for improved methods.

The second question set out at the beginning of this section is how to compute real capital and relate profits to it. If real profit is known but real capital is not known, no honest relationship between profit and capital can be stated and no honest test can be made of the effectiveness or of the real results of the business.

An experienced chartered accountant in Sydney[6] recently studied the 1955 results of 34 public companies in Australia. His study included some estimating but he considered his results sufficiently accurate to give in a recent address in Sydney to the Australian Institute of Management (Sydney Division). *For the purpose of illustrating the problem of relating profits to real wealth* it does not matter if more detailed data from a fully-fledged system of accounting for inflation produce slightly different figures. A summary of the results of the study is as follows:

(a) Whereas these companies have been reported to have paid 1955 dividends averaging 10.8 per cent of their ordinary capital, such dividends were equal to only 2.5 per cent of the fair current value of the net assets employed. (The mathematical absurdity of the traditional procedure of regarding a dividend in current £s as a percentage of £s put into capital a few or many years before will be apparent.)

(b) The published profits for 1955 were reported in each case by the financial press in terms which related that profit (less preference dividends) to ordinary capital. The average percentage so reported was 21.4 per cent. The profits (even before correction from conventional to real) were on an average equal to only 5 per cent of the fair current worth of the net assets backing for ordinary capital.

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[5] From *The Effect of Inflation on Accounting for Fixed Assets and Depreciation Policy* by E. S. Owens (1956), being an adaptation and improvement of an example in C.S.R.'s "Capital Erosion" booklet (1950).

[6] A. R. Mutton.

This reduction by three-quarters (from 10.8 to 2.5 per cent in the case of the dividends and from 21.4 to 5 per cent in the case of the profits) shows the difference between the impression created by conventional reporting and the facts extracted by someone who is prepared to have regard to assets employed and to changes in the value of the £.

Balance sheets which, in accordance with convention, record paid-up capital in various vintages of old £s and which likewise record assets in various vintages of old £s (and mostly in different vintages from the capital) cannot possibly be used as a test of the goodness or badness of profits. Only after all items have been converted from old £s to current £s can we get the best available picture of the amount of real wealth which is being used to produce the real profit. In recent years profits tested in this manner are proved in a large number of cases to be extremely poor—surprisingly so to many who have not chosen to think behind the figures presented by conventional accountancy. Given a sensible presentation of the facts with all items stated in £s of the same vintage, what reactions might we expect when profits are shown to be so poor in relation to resources employed? Management efficiency, tax equities, the division of returns between labour and capital, clear guidance to investors, are but some of the matters of vital importance which will, for the first time, be open to accurate assessment and corrective action.

The third question set out at the beginning of this section, dealing with the trend of profits from year to year, can be disposed of simply. To say that £105,000 of sales (or profits) in 1950 is better than £100,000 of sales (or profits) in 1949 (between which years there was a 9 per cent decline in the value of the £) is to say something that is not only foolish but wrong. Once regard is had to the shrinking value of the £, the figure for the later year is found to be lower in real terms than that for the previous year. Many of the financial page headlines like "Record Profit for XYZ Ltd" are plainly and simply wrong.

The point which is now stressed is that it is of the greatest importance that we should have a proper and sensible system of accounting for inflation. The consequences of not having one are too dangerous and must perpetuate many of the ills from which we have suffered for the past decade.

Some Effects of Inflation on Saving and Investment

Let us take the problem a little further and consider that important section of the community composed of people who, by a combination of instinct, intelligence and training, pursue their natural aims in a purposeful and earnest manner. Prominently represented in this group are those people who possess the capacity to apply themselves to earning the maximum of which they are capable and to accumulating what they can from their earnings in a programme of savings which gives them some property, a feeling of self-reliance, some security, something to help set up their children in life, and which at the same time provides a means to augment their future earnings. In the main these people are energetic, thrifty, and more efficient than others. They are the people who, by being prepared to work and save, provide that constant flow of funds which is translated into an extension of the community's physical productive resources. This is how Western communities achieve constant increases in their standards of living. This is how comparatively young countries like Australia provide the wherewithal to house, feed and clothe a population which may not be with us this year but which will be with us next year. And this is how we make the idea of a property-owning democracy a reality.

This is a very diverse group of people and they accumulate their property in different ways. They include many of our farmers and graziers, householders paying off or improving their homes, private entrepreneurs; and include, too, that very wide group of originating savers who place their savings in government bonds, in savings bank deposits, in Water Board debentures or company debentures, in life assurance policies, in real estate mortgages, in company shares and who, once upon a time, placed them in rentable housing. They are a mixture of rentier investors and entrepreneurial investors. And the numerous rentier investors constitute a large part of the basic source from which originate the funds that, in one or more later stages, are put to use by entrepreneurial organizations and producers.

In years of inflation a very large proportion of these people are unable to find within the structure of the existing community arrangements any safe avenue for the investment of their savings. Moneys invested in one year in governmental loans or in Water Board or other debentures are repaid some years later not with like £s but with unlike £s—£s which will not stretch as far, will not buy as much. The result is similar if they invest in savings bank deposits, life assurance policies or real estate mortgages. The loss of wealth arising from the depreciation in the currency falls heavily upon these savers and lenders.

It is surely a poor system of accounting—whether we regard it as business accounting, economic accounting or social accounting—which, by not measuring and recording what is happening, permits inflation constantly to eat into the savings which so many industrious and thrifty people have made.

Those who have the care of wealth are obliged to issue periodical reports to those who own the wealth. Orthodox accountancy has established no techniques to ensure that such reports will be issued in terms of real values. Trustees, agents, managers, these and all others concerned with the reports are still required by accountancy conventions to assume that none of the losses arising from the eroding influence of inflation have occurred. Most of the savers of the community have no pattern of thought, no line of action, no organization to seek those changes in the system without which their aims must be frustrated so long as inflation continues.

The saving habit is deeply rooted in our society and has truly vital functions to perform. It has suffered under severe discouragement and the force of it must steadily weaken if savings are left to carry so much of the burden of inflation for the community, especially as newer generations grow up becoming gradually more and more cynical about the value of saving. There is little doubt that inflation—especially inflation not comprehensively accounted for—feeds upon itself and spirally generates more inflation. There is no doubt that uncompensated inflation encourages people to come to the conclusion that the best hedge against inflation is to spend their money now. The money is worth more now than it will be later. "Let us," so they argue, "convert it into material satisfactions while it will buy more of them. If possible let us also capitalize on the situation by getting the motor car, the refrigerator, the washing machine on credit, by hire purchase or time payment or in some such way. We can pay off later in less valuable money. The goods are better holding than the money or an investment which will lose value. If we do lend or invest let us do so at a high rate, say 8 per cent or 10 per cent interest, then if we lose real capital at, say, 5 per cent per annum because of inflation we shall still have 3 per cent or 5 per cent left. But it's a pity we shall be taxed on the basis of the 8 per cent or the 10 per cent so perhaps it is better not to save and lend too much even at such rates. Probably we should still decide to save less and spend more now. We are learning to do the best we can under unaccounted-for and uncompensated inflation. And our children who are not inhibited so much by old-fashioned upbringing and ideas will know even better than we do how to handle the situation —and can fall back on government aid if needs be."

It is no answer to these savers for the more sophisticated to say that they can avoid this erosion of their capital by diverting their savings to forms of investment which will operate as a "hedge against inflation". The community has not as yet provided *any* form of investment which constitutes an *adequate* hedge against inflation. One way or another, every field in which the thrifty may like to invest is subjected to the damaging effects of inflation. The fortunate or the very well-informed may find some particular investments that operate close enough to inflation-compensated incomes to gain for themselves a fair degree of compensation. But virtually every field is affected by governmental controls and/or taxation not conditioned and supported by realistic assessments of community economics, but by the political convenience of the hour powerfully backed by nervousness about departing from the traditional. And, to be fair, the governmental authorities have as yet received little unanimity of professional guidance in the shape of techniques for departing from the traditional or for correcting hazy conceptions.

Investments in real estate might, on the face of things, appear to provide a reasonably adequate hedge against inflation. Quite apart from the impracticability of many small

investors entering that field, however, the subsequent course of inflationary time seemingly must, under present government policies, lead to a controlled rent inevitably giving an inadequate real return.

Ordinary shares in companies might, upon brief thought, be considered a better field in which the savers of the community might invest. Here, however, there are many hazards. For a variety of reasons, casualities amongst companies are numerous. Not many of the investors have sufficient wealth to spread their eggs and so obtain a reasonable chance that what they lose in the casualties will be made good by those businesses which go from strength to strength. Further, it is only a proportion of the savers who can, with any feeling of comfort or safety, enter into the technical language and procedures of the share market. Finally and most importantly, we find in the field of ordinary company shares (as set out later in these notes) that, although there is an inevitable trend for money values of the physical assets which back ordinary shares to move upwards as the value of money itself moves downwards, and although a wise or fortunate selection of ordinary shares is likely to give better results than government bonds, many factors are constantly operating adversely against companies in such a way as to render it unlikely in the generality of cases that inflation (combined with taxation or controls that do not take inflation into account) will take no significant toll.

There will be provided a little later in these notes the results of a number of companies which show in clear fashion the toll which has been taken and is being taken of the savings of those who choose to invest in ordinary shares.

C.S.R.'s Interest in Problems Arising from Inflation

While much of what has just been said does not fall directly and obviously within the responsibilities of C.S.R. the company realizes that it is necessary in such large problems to consider causes, effects and remedies in a wide context. By and large what is good for the general economy throughout the community will not fail to react to the betterment of C.S.R.

Since postwar inflation became apparent, C.S.R. has been interested in its effects on shareholders and on business operations, on forward planning, on depreciation and replacement of assets, on wages and salaries, on profits and dividends. In 1947 the chairman drew the attention of shareholders to this problem. In the same year the general manager commented on the trends, portraying them graphically. Although our physical turnover of goods was higher than in 1937, and monetary turnover higher still, the graphs showed a reduction of 15 per cent in net earnings for shareholders compared with a rise of 8 per cent in earnings, excluding overtime, of our typical Australian wage-earners. Both sets of earnings were expressed in real, not nominal, money values. The general manager's statement pointed out that, in addition, the wage-earner had improved his position in hours, annual leave, amenities and other conditions. And he emphasized that his concern was to bring relevant facts to light rather than to suggest a reversal of gains then accruing to wage-earners. (These trends, of course, applied in a field much wider than that of C.S.R.) "Increased production can bring improvements to both wage-earners and shareholders," the statement concluded.

It is towards increased production that we in C.S.R. continue to look as the basic means of easing the problems of inflation and of expanding productive resources still further as a means, in turn, towards continually raising living standards. In our own spheres we have been active in increasing production. But we have experienced difficulties, we continue to experience them, and we think it equitable, reasonable and in the community interest that public policy should be helping us and productive enterprise generally to overcome them.

One of our biggest problems is to keep our stock of production tools—machines and factories—up-to-date and efficient producers of goods. But such industrial tools cost money—huge sums—and this money must come either from investors or out of earnings. If taxation, price control or other public policies, by disregarding inflation, prevents us or any other company which produces goods and services from earning and keeping sufficient money to buy new tools when present ones wear out, or prevents us from paying shareholders enough

to enable them to save and to encourage them to invest their savings, then the community's store of productive tools will not increase adequately and material standards will tend to stagnate.

Since 1947 we have continued (not alone) to draw attention to these problems almost every year. In 1950 the company published a booklet, *Capital Erosion and the Income Tax Assessment Act*. This was directed to the need, on the grounds of both equity and the long-term national interest, for relief from income tax generally (not on companies only) of financial provisions made for the purpose of protecting the physical quantum of assets used in production. It called for, and proposed the method for, more truthful and more accurate yardsticks for the assessment of taxable incomes, especially in respect of depreciation.

Some Further Opinions and Actions on Accounting for Inflation

An indication has already been given of some of the simpler mechanics for correcting the error embedded in historical-money accountancy. More detailed expositions are spread through economic and accountancy journals and in some business writings. As far as an index of changing money values is concerned the Australian "C" Series Index of retail prices is good enough to apply pending the development of a better; and if a strong demand existed the Commonwealth Statistician would doubtless provide an even better index.

Individual companies have made a variety of attempts to remove from their stated profits those elements which are present by reason of a convention which assumes that the value of money never changes (or that although it does change it is no concern of accountancy). Those attempts, however, have been, in the main, of a rule-of-thumb type. Moreover, genuine though some attempts have been to keep the thoughts and ambitions of management, shareholders and employees within the limits of realities, the attempts have all too frequently been condemned by representatives of labour and of rentiers as attempts to gain some sectional advantage for business at the expense of other sections of the community.

One company in America, the U.S. Steel Corporation, implemented a comprehensive scheme to present economic realities in its annual reports to its stockholders. This step incurred so much misunderstanding and criticism in accountancy and other circles that the company abandoned its new and enlightening procedure.

Much has since happened to modify if not wholly to remove the objections previously voiced against that attempt by U.S. Steel. It may well be that many who previously criticized would at the present time admit that accounts like those temporarily presented by U.S. Steel constitute a much more truthful picture than do those prepared by conventional techniques. The position remains, however, a difficult one for any business contemplating a departure from traditional standards. Until the accountancy profession develops satisfactory changes from its conventional procedures and is prepared to support fully the use of these new procedures by the business world, it is difficult for individual businesses, no matter how well-informed and willing, to make a serious impression upon the problem. There are real risks in several directions for single companies in being out of step with current convention.

In 1952 the Institute of Chartered Accountants of England and Wales issued a stimulating statement on "Accounting in Relation to Changes in the Purchasing Power of Money". This is too long to quote in full but it included the following:

> The Council cannot emphasize too strongly that the significance of accounts prepared on the basis of historical cost is subject to limitations, not the least of which is that the monetary unit in which the accounts are prepared is not a stable unit of measurement. In consequence the results shown by accounts prepared on the basis of historical cost are not a measure of increase or decrease in wealth in terms of purchasing power; nor do the results necessarily represent the amount which can prudently be regarded as available for distribution, having regard to the financial requirements of the business. Similarly *the results shown by such accounts are not necessarily suitable for purposes such as price*

fixing, wage negotiations and taxation,[7] unless in using them for these purposes due regard is paid to the amount of profit which has been retained in the business for its maintenance.

That pronouncement of the Institute of Chartered Accountants of England and Wales (known as Recommendation XV) went on to give further warnings to accountants of the errors which could arise from the uncritical use of conventional accounts for many important purposes. The Recommendation concluded, however, with a suggestion to accountants that they continue to use historical cost until a generally acceptable means of reporting real profits had been found.

Other accountancy bodies of the United Kingdom declined to be so cautious. The Association of Certified and Corporate Accountants in 1954 made certain suggestions and recommendations aimed at eliminating from conventional profits the overstatements arising from wrong accounting (because of a change in the value of money) for stocks consumed in production or trading and for the wearing-out of plant.

The Society of Incorporated Accountants and Auditors, also in 1954, issued a statement recording the "anxious consideration" which its Council had given to this problem; noted "the harmful effects on the economy of profit measurements which disregard the implications of changing money values"; and suggested to its members "that encouragement should be given in appropriate cases to wider use of new conventions" (correction of accounting for the cost of goods sold and depreciation).

The Institute of Chartered Accountants of Scotland, again in 1954, issued a statement which, amongst other things, said: "The limitations [of the historical-cost basis of measuring profit] are evident and serious in periods of rapidly-changing money values. The experience of the postwar years has demonstrated a clamant need for new conventions and methods which will compute the profit element in terms of current monetary costs as distinct from historical costs. . . . The Council [of the Institute] holds the view that the accountancy bodies, singly and collectively, should now urge their members to take an active part in promoting the practical application of new conventions. . . ."

No accountancy institute in either Australia or New Zealand has as yet, by official pronouncement, given any lead to governments, to the business world or to the investing public on the means of solving this problem. There has, however, been more than a modicum of interest displayed in Australia and New Zealand. Several university men have written quite extensively upon the subject. So also have certain members of the Australian Chartered Accountants' Research Society. A majority of these writers have passed well beyond the broad question (which, in their view, is already answered—against conventional accountancy) and have devoted considerable attention to developing the best type of technique to meet the problem. The writers' plea to them is to put out a general framework incorporating major improvements without waiting for ultimate perfection. The research accountants know the main accounting answers and remedies.

There is an increasing awareness of the nature and effect of the problem among Australian and New Zealand businessmen, some of whom, where circumstances allow, are providing heavily, *out of profits conventionally assessed,* for higher replacement costs, despite lack of assistance from governments in respect of taxation and price fixing.

This procedure of retaining out of conventionally assessed profits the amount which is to be set aside to help to keep real resources intact is clearly not only desirable but absolutely essential if the living arrangements of the community (quite apart from the interests of shareholders) are to be maintained. It is a significant defect of the whole conventional system—indeed it is an economic tragedy—that, in some cases and on some occasions, the real profit is wholly, or almost wholly, absorbed by tax calculated on the unreal profit.[8] In

[7] Italics not in original.

[8] A case-study of the Jantzen company showed that for the year ended 31 March 1953 income tax was 49/9 in the £ on profit. The tax therefore took all the profit and ate into capital. See "What Should Accountants, As Accountants, Do About Changing Money Values?" *The Chartered Accountant in Australia,* February 1955.

such a case, the real resources cannot be maintained intact. This fact, important though it be to every member of the community, is known to but few. Moreover, the present system, which results in businesses reporting as profit amounts which are not profit, leaves many members of the community deluded; and it leads to increasing social and political tensions between the several sections which consider themselves entitled to contributions from the world of business and production.

In Britain there has recently been a significant development. This was reported on by the *Economist*:[9] "The Post Office provides full normal depreciation . . . and in respect of telephones . . . the department has tucked away useful little additional sums towards the increased cost of replacements. Yet the telephone account was on the road to insolvency. Normal 'straight line' depreciation, plus the extra sums ploughed back, were deficient by £12½ million a year to replace the equipment at current cost. . . . 'A telephone in every home' was a fine slogan. A telephone at a loss in every home is another matter. Wisely, the Postmaster-General has discarded all half measures and moved to a full replacement basis." The Postmaster-General, in his report to parliament, after discussing the need for providing for depreciation on a replacement basis, said "The Government's view is that from 1956-57 onwards provision should be made accordingly" in respect of the telephone system. This means that telephone charges will be increased to cover the higher costs of depreciation on a replacement basis.

The United Kingdom National Income papers have recognized the problem and tried to make allowance for it in national accounting. Although Australia has not followed suit, the Australian National Income papers do seem, by implication, to accept the principle where, for instance, *National Income and Expenditure, 1954-55* (as presented to parliament) says, "There are as yet insufficient price and quantity data available to make satisfactory estimates of all items in terms of constant prices."

The United Kingdom official Blue Book, *National Income and Expenditure, 1946-51*, issued August 1952,[10] states in the Introduction:

> It is fundamental to the concept of the national income that it measures what is available to the nation for consumption or adding to wealth *after maintaining capital intact*. This means, inter alia, that in reckoning the national income . . . an allowance must be made for the current depreciation of the fixed capital of the nation. The income generated in the production of any commodity must be reckoned after setting aside a provision for the replacement of fixed capital used up during the period. Further, it is the *real* capital of the nation which must be maintained intact *if the measure of the national income is not to give misleading results*.[11] The correct measurement of the national income therefore requires that *income shares*[11] should be defined after allowing for the current depreciation of capital at current replacement cost.

The publication goes on to say, "unfortunately, however, it has not yet been possible from material available to construct estimates of income on these principles". It suggests that "the 'true' current depreciation of fixed capital is not . . . more than about 10 per cent" of the national income. As recorded depreciation (income tax-based depreciation other than initial allowances) appears to be rather less than 6 per cent of the national income the additional amount required to reach "true" depreciation is, of course, an important proportion in any estimate of the actual national income and, more especially, in any assessment of the shares of it or of depreciation as such.

The United Kingdom 1952 Blue Book deals with stocks of goods and material similarly, in principle, to depreciation and replacement of wearing-out assets, and with more effect in practice, saying, " . . . the contribution of the entrepreneur to the national income must be reckoned after charging as a current cost the *replacement* cost of the materials used in production, which, in general, will be different from their *original* cost. This is not, however, the principle on which normal accountancy is based. . . . The adjustment for stock appreciation . . . is also important since if it were not made the movement of the figures for gross

[9] Issue of 29 October 1955. [10] i.e., the 1952 Blue Book. [11] Italics not in original.

capital formation and the gross national product would be highly misleading in periods when prices were changing rapidly." And, in another place in the same publication, the statement is made, "The stock appreciation element is . . . deducted from the profits as conventionally defined in arriving at the national income. . . ."

The importance of the adjustment of stock values, which the United Kingdom authorities proceeded to make on an estimated basis, is shown by the figures in the Blue Books. The highest adjustment figure is for the 1951 year, shown in the 1954 Blue Book as £Stg. 750,000,000, equal to 6 per cent of the "gross national product".[12]

The United Kingdom National Income Blue Books continue to make adjustments for "stock appreciation". Furthermore, according to a United Nations publication,[13] the United Kingdom is planning "to prepare estimates on a replacement cost basis for all national accounts"; and "in certain countries, the capital consumption provisions for particular industries are valued at replacement cost: both Ireland and the United States, for example, measure depreciation in agriculture on this principle."

What is correct in principle and practice for national accounting and for the assessment of shares of the national income is surely correct for business accounting, including that of individual entrepreneurs. For, as the United Kingdom 1952 Blue Book says, " . . . the national income is the total of the incomes of all United Kingdom residents (including . . . British companies and the British Government) so far as they are derived from current economic activity, i.e., from a contribution to 'production' in its widest sense." And " . . . the national income is a measure of the value of goods and services becoming available to the nation for consumption or adding to wealth." (The real position of a company is clear if we substitute the word "company" for "national" and "nation" in the last quotation.)

If in the United Kingdom (and in some other countries) the leading economists, statisticians and government experts consider that inflation of the price level should be accounted for in respect of the nation's affairs by making stock appreciation adjustments, is there not just as forceful an argument for making similar adjustments within companies and within other businesses? If the United Kingdom considers that, when computing national income, the cost of productive equipment consumed in the process of production should be computed after adjusting for the higher current costs of its replacement, it seems reasonable that a similar adjustment for the cost of replacement of industry's productive equipment should also be made.[14] Both the nation and the company use the forms and conventions of money accounts to record movements in the levels of and in the distribution of physical resources, and to relate one resource to another in common terms. It is the physical realities which matter, both on the national and on the sectional planes of production. If the accountant's and statistician's figures do not reflect an accurate image of that physical reality they are mere distortions; the shadow is mistaken for the substance, like the shadows cast on the wall of the cave in Plato's famous allegory.

The Level of National Savings

It is generally believed that Australians as a nation are big savers, that there is a high level of investment. It is the net saving and net investment that counts. To get a true result

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[12] The United Kingdom no longer computes "national income", which is "gross national product" less "depreciation", because the United Kingdom has not yet been able to arrive at a true figure for depreciation and apparently does not wish to record an inaccurate and misleading figure for "national income".

[13] *Methods of National Income Estimation*, 1955.

[14] C.S.R.'s view (as set out in the "Capital Erosion" booklet) is that the primary, broad and really important general adjustment should be for the degree of *general inflation*. Replacement adjustment is a separate and additional matter which, following an adjustment for general inflation, may be a plus or a minus; it would be of minor importance once the primary adjustment was made. There are arguments of some strength against replacement adjustments for, say, income tax purposes, which arguments do not apply to the primary adjustment for general inflation.

when the savings are assessed in money terms, there must be an adequate provision for the extent of the consumption of the accumulated stock of productive resources. The monetary savings and monetary investments have meaning only in relation to the physical resources they represent. All through any one accounting period of a year or a series of years the inherited stock of resources available at the beginning (and even those resources added during the period) are being gradually used up. The only real measure of addition to total resources for the year or period of years is the extent to which new resources are created less the extent to which the old resources are dissipated. Again, the using-up can only be adequately assessed in terms of current price levels (or in terms of the same price levels or monetary values by which the new resources are being measured).

This kind of adjustment is not made in the Australian statistics of national income and of national investment and savings. Therefore savings in Australia in recent inflationary years are not nearly as high as is often supposed. And, as Australia has had in recent years more inflation than other countries with which our performance is normally compared, the overstatement of savings is greater in the case of Australia, and a more serious error occurs.

Wage Fixation and Negotiation

Dr R. W. Harman, general manager of C.S.R., in the chapter *People and Work in Factories* has expressed views on various aspects of employer-employee relations, including the need for more informed and more detailed economic data to be available to wage-fixing authorities. Such data is essential, too, to guide the considerations of employers and employees. The wage tribunals have long taken into account the effects of inflation or deflation of money values on the real value of wages, often by specifying automatic adjustment. It seems obvious that the economic data used by the wage-fixing tribunals should take into account the effect of the changes in the value of money not only in some respects but in all respects—for instance, on all parts of the national income statistics, on assessments of trends in company profits, on dividends expressed as a percentage of older and more valuable money, and on the value of assets employed in making the profits. In economics or in social affairs it is absurd, and it is certainly not applied science, to measure profits, or the trend of profits, in terms of current low-value money, without full adjustment for the change in the value of money, for the change in the real value of the assets employed to make the profit, for the change in the real cost in current £s of the wearing-out of the existing level of physical assets.

The absurdity may be illustrated by mentioning that in a period of inflation and under historical-cost accounting a part of the cost of providing for the continuation of production (and therefore of employment) *at existing levels* will appear as a profit instead of as a cost. The assumption that often follows is that as profits appear to have increased it may be possible to use some or all of the higher profits to increase wages. When, in reality, the apparently higher profits do not exist, the results are bad. (It is emphasized again here that much that is published in company reports as profits and held undistributed, and perhaps some of the money distributed as dividends, is really cost; if it is cost but is treated as profit and distributed it becomes a distribution of what is actually capital.)

As a greater increase in earnings than in output is inflationary, accurate figures for, at least, overall national productivity have a most important part to play. Other countries possess indices of productivity. To be of value and not to add merely misleading information, the indices would, of course, need to allow in full for replacement at current prices of all assets consumed in the process of production.

The tremendous importance of the wages question is sometimes minimized. But Professor R. F. Kahn, Cambridge economist, recently said, "In the Keynesian system the money wage is the fulcrum on which the price structure rests. *The behaviour of prices depends on that of the money wages rather than the other way round.*[15] And a movement of money wages brings about a more or less proportionate movement of prices, after allowance is made for improvements in productivity."

[15] Italics not in original.

And as Oxford economist, Professor J. R. Hicks, said recently when reviewing a book on wages policy which challenged the realism of his own earlier theories: "It is now obvious that the fixing of wages is at the very heart of our economic problem."

2. SOME EFFECTS OF HIGH TAXATION OF COMPANIES

When a number of people pool some of their resources and combine together to do business as a productive organization in the form of a public company in Australia they are taxed twice on their earnings—once as members of the company and again as individuals. From the viewpoint of governments seeking taxation fields to exploit with a minimum of immediate and troublesome political repercussions such associations of individuals pooling their resources appear to be "sitting shots". But the questions still remain to be answered: Is the community's material interest actually served by such high company taxation—is the taxation socially and economically useful or harmful? And is such taxation equitable?

On the question of utility, it is interesting to note the concern now expressed in Western countries about the advances made in the Soviet in technology and in the numbers and quality of technologists. But it is not of much use the Western countries becoming so concerned unless they are to become equally concerned about other important factors that are, relatively, restricting production in those countries. We can be sure that the Russian communists, with their great emphasis on production and materialistic advance, would not hold back by severely-limiting taxation any of their most important means of production. While analogy from communist totalitarian practice is naturally suspect and could not be carried far, it does suggest that policy could well give a higher place to easing the restraints on production and to switching taxation more to the ways in which the fruits of the production are expended, so that the inhibiting effect on increasing total production is minimized. The effect of the present taxation system is considered at more length later in this section of these notes.

Turning to the question of equity it tends to be overlooked that most taxation is, in greater or less degree, confiscation—by government for public use (and much of it necessary usage). In Australia there has recently been much public debate and governmental action on high taxation—the stated purpose being to prevent people and companies from spending their money, which spending is held to be inflationary. In all the debate no one seems to have raised the question of the extent to which these are proper and right procedures. Edmund Burke said: "The great contests for freedom in this country [England] were from the earliest times chiefly on the question of taxing." Whether Burke's observation needs qualification or whether evolution towards a greater degree of democracy, and the welfare state, alter the emphasis on this aspect of the "contest for freedom" may be open to debate. This is not to say that to raise the questions of confiscation, of freedom, of equity, makes a case against all taxation proposals, but at least it suggests that all taxation is still open to full consideration in the light of freedom and equity. Burke's reminder certainly points the way towards emphasis on equity. It clearly becomes more important at high levels of taxing to give great emphasis to equity (and to base the tax on accurate and not on misleading data).

Double Taxation of Public Companies' Profits

The present taxation rate on public company profits in Australia is 8*s* in the £. But no allowance is now made for the tax already paid by companies when taxing the dividends as personal income of the shareholders. This double taxation system was introduced as a wartime measure only,[16] but has been maintained. There are several points to be made on this matter.

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[16] The following remarks were made by the Federal Treasurer, A. W. (now Sir Arthur) Fadden, when introducing double taxation of company dividends—Hansard, 21 November 1940:

"It is proposed to obtain a further addition to individual income tax by abolishing the present rebate of tax in respect to dividends on which company taxation has already been

The first point relates to *the measurement of the total of the nation's company profits* as an absolute amount and as to the trend in them. When company profits in the prewar and postwar periods are compared the profit figures used are often the profits prior to income tax. *As a comparison* this is invalid and most misleading, because now those profits will be taxed twice instead of once.

The second point relates to *the comparison of shares of the national income.* As the owners of companies cannot receive more than the profits after company tax is met, and are taxed again on that money as personal income on an equal footing with all other personal incomes, company proprietors' share of the national income is overstated in the official national income statistics *vis-à-vis* other income groupings where income tax makes its impact only once. In the Australian national income papers there is a notation that the company income is stated before deduction of company income tax but many commentators when computing shares of the national income tend to overlook the effect of this. The measurement of company profits as a proportion of the national income is discussed further in a later section of these notes.

The third point is that *the double taxation system amounts to a special discriminatory tax on the corporate way of doing business,* not imposed on other business organizations or on other means of producing the community's goods and services. It is akin in some ways to the special taxes imposed, discriminatorily, against certain luxuries and goods like potable alcohol to discourage their production and consumption as well as to raise revenue. It has a similar result and constitutes a powerful force in discouraging company enterprise and higher levels of productivity by companies. It operates directly to increase the companies' and hence the community's cost structure and to reduce ability to compete in overseas markets. A question of quite fundamental importance is: Is corporate enterprise—one of the principal means developed by Western civilization for making material progress and raising living standards—to be treated as a luxury which we can do without, or of which we can do with less, and, therefore, to be discouraged by a special kind of selective taxation?

One sometimes sees statements about the so-called separate "taxable capacity" of companies. None of such statements, however, gets over the point that the profits from an owner's capital put to work in a partnership, in a retail shop, in a farm, in a carrying business, or by lending to governments, water boards, companies, etc., is taxed once only—as surely it should be; but, if the owner puts the capital to work instead as a share of a company enterprise, the profit is taxed twice (and heavily in the hands of the company). This, it cannot be said too often, requires consideration from the viewpoint of equity, as well as of utility for the community.

The fourth point relates to *the exceptionally severe impact of the double taxation system on shareholders with smaller incomes.* If a shareholder on a small income, such as a widow living on her late husband's savings, has a taxable income of £500 a year she is assessed for personal tax in Australia at £27, i.e., at 1*s* 1*d* per £ of taxable income. But, if any of that income comes from dividends from a company, she has already been taxed on it while it was in the hands of the company, at 8*s* in the £. In her case not only has the tax paid while in the company's hands been very much too high already but the same income will be taxed again. If an Australian has a taxable income of £1,000 a year he is assessed for personal tax at £106, i.e., at a rate of 2*s* 1*d* in the £. Personal income tax rates do not reach 8*s* in the £ until taxable income reaches about £6,500. The injustice that is done all shareholders by the system of double taxation of company dividends is great but, relatively, it reaches exceptional heights (or depths) in respect of shareholders who do not have large incomes. The evidence on the wide

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paid. A good deal could be said in favour of a complete rebate of all company taxation, but considerations of revenue and of administrative difficulties make that quite out of the question at the present time. It is proposed as a wartime measure to discontinue the rebate with the hope of reconsidering the whole question when the urgencies of war finance are behind us . . . I doubt if it is wise to put such a load permanently on company enterprise, which plays a large part in the industrial development of Australia, and only the urgent need of revenue has necessitated the increases now proposed as a wartime measure."

spread through the community of C.S.R. shareholdings, and on the number of people of moderate means who own such shares, has been given in this book. There is also the impact of the tax paid by companies under the present system on dividend recipients who are intended to be altogether free of income tax—for example, employee provident and superannuation funds.

The fifth point is the way in which *double taxation acts as a direct encouragement to companies to become borrowers,* instead of taking in more partners in the risks and ownership of the enterprise.

Some further observations now follow bearing on one or more of these five points. But first it can be noted that in 1953 the Australian Federal Government took an appropriate step in abolishing the special additional tax on income from property which, in respect of company dividends, constituted a kind of triple tax. In respect of dividends this reduction has been more than offset for most shareholders by the recent increase of 1*s* in the £ in the company tax rate.

The system of double taxation does apply in countries other than Australia. Although qualifications are needed for fine comparisons it can be said, however, that it does not apply in New Zealand; nor in the United Kingdom except in relation to the supplementary tax known as Profits Tax.

Double taxation applies in U.S.A. and Canada, but generally circumstances there have been very favourable to corporate enterprise, especially in that it has not been much concerned with competition from non-taxpaying government and co-operative enterprise. Moreover, the double taxation in those countries has more recently been alleviated—considerably in Canada[17] although not so much in U.S.A.[18]

(It is desirable to keep in mind when thinking of the level of taxation in the United States that that nation is still supporting a defence expenditure approaching that of a war economy—much greater relatively than that of Australia.)

When the Secretary of the United States Treasury was introducing the alleviation in respect of dividends, he said:

> Dividends are the incentives which provide risk capital. It was risk capital, primarily, which made possible the phenomenal growth of America . . . in the mid-1930s there crept into the tax laws, in confusion attending an experiment with an undistributed profits tax, full double taxation on dividend income. Now, the useful citizen who supplied the risk capital had to run the tax gauntlet twice. First, his share of the company earnings took the full whack of the corporate income tax; next, when the residue reached him as dividends, he had to pay on it the full personal income tax. When this unfair levy was first imposed, Federal taxes were relatively low, so the load was not too tough. Then came the war and its aftermath. As taxes soared, the double levy on dividends soared with them.

A United Kingdom Royal Commission in its final massive report on *The Taxation of Profits and Income* (June 1955) rejected double taxation of company profits in principle. The majority, 11 members, said, "It seems to us a wrong principle to subject the shareholder (whether by deduction at source or otherwise) to income tax liability on his receipt from the company in any way that altogether ignores the fact that the profits from which the dividend is drawn have paid corporation tax in the company's hands. We accept the criticism

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[17] The Canadian Federal Government adopted a plan known as the dividend tax credit, under which dividend receivers have the tax on their dividend income reduced by 20 per cent *of the dividends.*

[18] In U.S.A. as in Canada the alleviation applies at the shareholder or personal level. The whole tax position in U.S.A. is greatly affected by the provision allowing husband and wife to average their incomes before rates of tax are struck. Each party is taxed at the rate applicable to half the joint income. Further, all dividends up to a total of 50 dollars per annum per individual taxpayer are excluded from income and 4 per cent of all further dividends received is allowed as a direct credit against the tax assessed.

that it is double taxation to treat a company dividend as being wholly a new source of income." (However, after consideration, spread over some pages, of practical difficulties the majority could not find, in the present circumstances in the United Kingdom, a practicable solution which would altogether avoid an element of double taxation in respect of corporation Profits Tax. Double taxation is already avoided in the United Kingdom in respect of Income Tax.)

Double taxation of company profits is having a considerable effect in swinging companies away from ordinary or "equity" capital-raising and is thus turning investors more into rentiers. There is, of course, an important place for finance by borrowing and for rentiers who invest for an interest return and definite repayment of capital. But most people would be sorry to see such a trend away from risk-bearing and ownership towards rentiership. The Secretary of the U.S. Treasury comments:

> The double taxation of dividend income has made it increasingly difficult to attract risk capital. . . . Consequently, most funds from outside the business have come from borrowing rather than from the sale of stock [i.e., ordinary shares]. This is not the best way for America's economy to finance its expansion. Bonds, of course, have their proper place, but when a company gets top-heavy with bonded or other debt, it has to watch its fixed charges the way an invalid watches his blood pressure. It moves timidly instead of boldly. It nervously slows down when the going is rough. It shrinks from the uncertainty involved in promising new ventures. In other words, it loses the very spirit which has made this country great. That is why I am so glad to see some reduction in the double taxation of risk capital. Modest as it is, it will halt a dangerous trend and set us back on the road of vigorous advance.

The means to correct or greatly alleviate the double taxation need not be expanded on here. Methods are well known, at least in respect of profits distributed as dividends.

Company Tax a Cost of Production Inhibiting Productivity

It is thought by some, because company tax is levied as a proportion of profits, that it does not operate as a cost and as a brake on development and efficiency. It is desirable that the reasons why this is not so should be quite clear.

At the present rate of Australian public company tax, to earn £100 *for the shareholders* a company must make £166 13*s* 4*d* before tax. Of the £166 13*s* 4*d*, 8*s* in the £ or 40 per cent of that sum, viz. £66 13*s* 4*d*, will be taken in company tax. The £66 13*s* 4*d* cannot be regarded in any way other than as a cost as it is clearly an expense of carrying on the business for the owners. Only the £100 is available as profit to the shareholders.

Selling prices of goods and services as now traded have become established so that they carry the cost of company tax along with other costs. Where to some small extent this has not yet happened, as in respect of the recent increase in company tax, it is in progress. If it has not occurred the company is becoming an unsuccessful one, although the retrogression may be slow. Unless the company brings about a change in the situation it has no real future. In the longer run it must, to survive, cover the cost of taxation and cover as well the necessary level of distributed and undistributed profits. Certainly new ventures will not be undertaken that will not amply carry the full cost of current rates of company tax.

Take the case of a company which in its business judgment considers that it requires a net profit *for shareholders* of 10 per cent per annum[19] in order to justify capital expenditure for expansion or greater efficiency of the business, such as an investment in new and improved machinery. The relevant factor is the profit *after tax* because that is all the proprietors

[19] The rate of 10 per cent after tax is used here for illustrative purposes because it provides an easy base for calculations. The actual rate businesses aim for varies with different ventures and depends on many factors, on opinions and on judgments. Many enterprises, in the light of current interest rates, would not consider basing plans for many lines of business on earning a lower rate. The rate may be arrived at by historical-cost accounting methods, thus overstating the real profit in an era of continuing inflation.

can receive. With tax at 8*s* in the £ (i.e., a tax rate of 40 per cent on profits) the net percentage return needed, to give 10 per cent after tax on the new capital investment, becomes $\frac{10 \times 100}{60}$; this equals 16⅔ per cent per annum. The extra 6⅔ per cent profit (or, stated more vividly another way, the increasing of required profit margins by two-thirds because of company income tax) has a tremendous effect on business decisions. Countless are the decisions against additional investment for expansion or efficiency entirely because of this extra cost (or of the 7*s* in the £ tax that has been operative in recent years).

For comparison, consider the cost of tax if it were 4*s* in the £; then the required return on the new investment would be 12½ per cent, to net 10 per cent, which is an added burden of only one-quarter, instead of two-thirds. Instead of requiring to make £166 13*s* 4*d* in order to have £100 profit, it would only be necessary to make £125.

Let us illustrate the position even more concretely. For sugar milling, transport and refining in Australia the capital required at current price levels is about £130 per ton of sugar sold per annum. On this capital the extra cost due to company tax, calculated by the methods and at the rates just discussed, would increase the price of refined sugar by £8 13*s* 4*d* per ton, or nearly 1*d* a lb.

There is another way of showing the effects on efficiency of the high tax rate on companies. All directors and members of senior management in manufacturing companies know the effect on their decisions of the facts that working expenses—for operations, maintenance, and so on—are fully allowable deductions when taxable income is assessed and that in the case of a public company 40 per cent of them are now borne by the Treasury. This is a powerful influence which tends to keep out-moded methods operating and tends towards the maintaining and repairing of old equipment, because only 60 per cent of the expense is carried by the business. On the other hand capital investment, especially in long-term fixed assets, runs many risks—risks which are aggravated in an age of inflation, of historical-cost accounting, of inadequate replacement allowances, of threats of nationalization and of direct controls; all these risks tend to raise the required rate of profit, to which two-thirds must be added.

Let us relate this second approach, which is from the expenses side of the question, to the first approach, which was from the profit side. Take the case of a company which, on close examination of its methods, finds that it could save £1,000 annually in wages and all other expenses after allowing for the additional depreciation (and probably at the same time reduce arduous physical work) for a capital expenditure on mechanization of £10,000. This appears to be a profit of 10 per cent and let us assume that, if reasonably certain, it would be enough to satisfy the company's board. But the capital-cum-mechanization method of carrying out the function of production is subject to taxation which the other and more laborious method is not. The progressive method substitutes the cost of profit plus the cost of tax on profit plus the cost of more depreciation for other kinds of expense, more often than not largely labour. But the cost of £1,000 being incurred by the old method of production is fully allowable when tax is assessed and, therefore, in fact does not cost the company £1,000 but only £600 (£1,000 less 40 per cent thereof as tax). The real saving is only £600; and this is 6 per cent on the expenditure of £10,000, whereas the board has decided it requires a net 10 per cent. The board therefore decides against the expenditure and against the mechanization. Productivity receives a set-back.

The answer obtained by this approach is the same as previously arrived at, viz. in order to cover the taxation, the profit margin needs to be two-thirds larger—in the latter example 10 per cent instead of 6 per cent.

These points can be kept in mind, too, for the occasions when management is being criticized for lack of efficiency or lack of progress. While there are, in some situations, other roads towards efficiency, the main long-term route is mechanization and automation. In other words it requires capital, with which must go hand in hand the prospect of profit. Many feasible progressive steps will show a 10 per cent return, or whatever other figure the company requires, but a high proportion of those will not yield the additional two-thirds.

Effects of Inflation on Taxation of Company Profits

Many countries have taken steps, in differing ways and in varying degrees, to assist productive enterprise with the problem of inflation, in so far as taxation is concerned. Australian tax rules did give some help by initial depreciation allowances a few years ago but this has now been withdrawn except for primary producers. As Australia has had and still has a high degree of inflation it is all the more difficult to appreciate why our tax system continues to tax a part of capital as well as profit (by overstating profit) and so reduces the ability of the business world to expand its resources in order to achieve the greater production which would operate as an anti-inflationary force.[20]

The latest comprehensive consideration of the question of inflation and taxable incomes known to us is the United Kingdom Royal Commission's Final Report (June 1955) on *The Taxation of Profits and Income*. The whole commission of 14 members (after discussing the matter over some pages and pointing out certain of the consequences of its recommendations) said, "we think that *for the purposes of taxation*[21] a system of computing his [a trader's] profits that does not make allowance for these factors [replacement of fixed assets or fall in the purchasing power of money] is preferable to one that does." The Royal Commission, however, had said in its introduction, "We take it as our general premise that there will not be any marked decrease or increase in the purchasing power of money in the United Kingdom"; also, "Indeed, if we had thought that we were obliged to assume a persistent decline in the purchasing power of money, even if a slow one, our examination of the problem of dealing with the inflationary element in profits which are computed without allowance for the decline would have started on a different basis and might have reached a different conclusion." The Royal Commission reported that schemes for allowing more depreciation to offset the effects of inflation have been adopted in Belgium, France, Germany and Italy. The Royal Commission added, " . . . the problem of the trader is a formidable one when he has to meet at the same time high taxation on his profits and a greatly increased cost of replacement; and therefore some measure for alleviating the weight of taxation of business profits is to be looked for as a normal incident of the tax code." The Commission, having already assumed that inflation would not occur to any considerable degree, stated also that it assumed that business would continue to have available to it either the higher initial depreciation allowances or investment allowances.

On the question of stock valuations the Commission recommended more freedom, including a qualified form of L.I.F.O., the minority of three members dissenting. L.I.F.O. means valuation of trading stocks on the basis of "last in first out". It is in contradistinction to F.I.F.O. ("first in first out") which assumes that the oldest stock is used first. In a period of inflation the use of L.I.F.O. reduces taxable profits and helps with the problem of stock replacement at higher cost. L.I.F.O. has long been available to taxpayers in the United States. L.I.F.O. is not a true accounting for inflation in respect of stock and may lead to further problems. It is a palliative against inflation and high taxation and its use shows how some countries are prepared to assist business with the problems of inflation and taxation.

In arriving at taxable incomes, accounting for inflation, whether in respect of depreciation, stock values or in still wider directions, would affect all business and trading incomes. But,

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restricting the discussion to *companies* in Australia and contrasting the situation with the comments of the United Kingdom Royal Commission, it can be noted that in Australia we have double taxation but neither investment allowances nor initial depreciation allowances. L.I.F.O. is not allowed, nor is any other form of relief. And we are experiencing continuing inflation.

That the failure to take out of profits the element that arises from inflation and is not real profit is not a minor matter has been mentioned in these notes. Many more illustrations could be given but a few will have to suffice.

There is the adjustment, previously referred to, of the United Kingdom national income to the extent of £Stg.750,000,000 in 1954 for stock values alone; this huge figure included no provision for adjustment of depreciation of fixed assets.

The example of the truck owner who lost one-third of the real value of his asset in five years (and lost production capacity) has often been matched in practice, as has the example of the shirt merchant. The example of the Jantzen company (footnote 8) is very striking and based on an actual experience.

There is still a lot of prewar plant in use in Australian industry; indeed much of the plant renewal to be done in the next 5 years will be of prewar plant. Even if we have no more inflation this renewal is going to cost in the vicinity of three times the original cost. Only original cost has been allowed for taxation depreciation purposes and depreciation on that basis is all that has been allowed for in the official national income statistics.

As a further example of what is occurring, suppose a company tries to make provision to the extent of £1,000 for the replacement cost of wearing-out plant being higher in terms of money than the original cost. The additional income set aside for the higher cost of replacement will be assessed as taxable profit so that, with tax at 8*s* in the £, the company has to make and set aside not £1,000 but £1,666. The inflation, in this example, has made the functioning of the company harder to the extent of £1,000 and the tax system, by ignoring the inflation, has increased this burden to £1,666.

The Taxing of Governmental and Co-operative Businesses

Private corporate enterprise faces in several spheres in Australia the competition of government enterprise which is free of tax and which has almost unlimited new capital available to it substantially irrespective of its efficiency or profit record. In other spheres ordinary companies face the competition of co-operative organizations which are almost free of tax.

Some co-operatives enjoy an extraordinary position under the Income Tax Assessment Act in that they can charge the repayment of certain capital borrowings to whatever taxable profits remain. This tax favouritism for co-operative enterprise, and bias against ordinary company enterprise, is also partly the product of double taxation of public companies. The largest element of discrimination between co-operative and other companies would disappear if double taxation were abolished and if the extraordinary exemption co-operatives enjoy of tax-free repayments of certain capital borrowings were also removed. On another view: the discrimination, although still objectionable in principle, would be less serious, even under the *present system*, if public company tax *rates* were quite low.

The question of taxing government enterprise seems, strangely, to have attracted little attention in Australia. In the United Kingdom nationalized industries and public utility undertakings are subject to profits tax at the lower (non-distributed) rate and there are some other distinctions. The recent United Kingdom Royal Commission recommended unanimously that the profits of nationalized and public utility undertakings "should be taxed like those of any other trading entity".

At low tax rates (or if government and co-operative business activities were taxed on an equal or near-equal basis) it is unlikely that private enterprise would fear such competition—and would have no basic complaint which it could legitimately make, unless other kinds of favouritism were to apply. But the weight of taxation on ordinary companies has been shown

to be great and there is a major doubt whether, in the longer run, companies will be able to compete if present conditions persist. Those companies which are not exposed to government or co-operative competition seem scarcely aware of these matters, but considerable fields of company enterprise are feeling the effects. C.S.R. has had to stand aside in recent years and see a government instrumentality provide the capital for a business the company had planned, because the government organization had access to a large volume of cheap governmental capital and would pay no income tax.

Company Taxation—Conclusion

It is regrettable that in recent years there has not been in Australia a comprehensive and public examination and public report on the taxation of profits and income—or an even wider examination of the taxation system—by a body of reputable men of wide experience. There is no adequate counterpart in Australia of the five United Kingdom reports between 1951 and 1955 (the reports of the two Tucker Committees and the three reports of the Royal Commission). There was an inquiry in Australia, by the Commonwealth Committee for Review of Taxation, whose report was made in 1954, but unfortunately published in part only. The non-publication of the rest of its report is regrettable and gives grounds for concern that the unpublished parts were withheld because they were out of line with ministerial or departmental views. The *Report of the Commonwealth Committee on Rates of Depreciation*, dated 31 March 1955, is useful and informative within the strict limits imposed by its terms of reference. These, strangely and despite representations, ruled out consideration of depreciation in the context of inflation.

It is time for basic examination *by a very high-ranking body*. What were in the past merely potential or minor causes of higher costs, minor brakes on production or minor causes of inequity have become real, effective and major because of the changed circumstances and the combination of factors such as high taxation rates, inflation and the use of old accounting methods inherited from a period of stable money and incapable of handling the effects of inflation. Matters which in prewar times were of potential, academic or theoretical interest have, in the new circumstances, become real problems of great importance.

The foregoing comments about the taxation of companies have been made for the following purposes:

(a) To show the special discrimination and discouragement exercised against the corporate way of producing the community's material welfare, especially by double taxation and high rates of tax.

(b) To indicate a matter further developed later in these notes, viz. the national income statistics are misleading (although unintentionally) in respect of company profits, both as to the trend since prewar and as to their share of the national income.

(c) To highlight the burden and the consequences on production of taxing as profit what is not economic profit but appears as profit under conventional historical-cost accounting in a period of inflation.

(d) To point out the existence of tax discrimination in favour of government enterprise and co-operatives and against corporate capitalism; and to point to the existence of tax-havens for persons who can organize their activities on a co-operative basis, as an increasing number are doing.

These matters merit consideration in the highest places on the score of equity as well as on the score of the community interest in production for higher living standards and for national survival.

The question of equity might not be so important if taxpaying private corporative enterprise had no competitors, or if tax rates were low; but neither of these conditions applies.

To advocate adjustments in the tax system, reduction of certain taxes, or even a reduction in total taxation revenues is not to lose sight of the need for governmental expenditures in the world we live in. But in the social revolution or evolution that this age is witnessing

taxation is the principal agent of the change. The electorate has in recent years been faced with a clear choice on whether it desires more or less statism and, with the wartime and immediate postwar experiences fresh in mind, it seems to have decided against more of it. A consistent policy would therefore strive to keep governmental expenditure as low as possible and to raise the revenues needed for redistributive and other necessary purposes in ways that would give the least impetus towards statism. Within the limits of the need to raise a certain amount of revenue, differences in effects arise—effects on productivity and on equity—depending on *how* the amount is raised. And, as mentioned in Chapter 15, the fruits of steadily increasing productivity could be used to reduce the proportionate weight of the tax burden, in total and in various directions.

Much of the authoritarian statist attitude towards taxation necessary in wartime (and accepted in such a time though perhaps containing elements of inequity) has been continued in the postwar era. The tax system in Australia still retains part of the wartime characteristics and outlook—an outlook which regards the "stick" as a more convenient instrument than the "carrot" except where the more powerful and articulate groups are concerned. Some important considerations both of general utility and of equity would make for political difficulties—so the outlook runs—because of emotional reactions inherited from a collectivist-minded past which gave little heed to production and assumed that more and more equality is the greatest good, more important than other personal aspirations and more important than progress. "While such emotionally-established concepts developed in the past 50 years may be counterable or modifiable by facts and reason," so the outlook says, "we had better not stir up anything. Even the reports of expert bodies set up to study these questions may cause inconvenience so we will select what to publish from their findings."

The submission is that more consideration of the "how" in levying taxes, more attention to taxation on expenditure and less to taxation on income (as income includes saving), more incentives for productive endeavour, less government expenditure of marginal value, less subsidization of some government enterprises, like most of the government railways, which should pay their own way (including the meeting of depreciation and replacement), could alleviate both the gross burden and the incidence of taxation and could result in more equity while encouraging production.

It is interesting that the terms of reference of the recent United Kingdom Royal Commission included this direction: "to consider whether for the purposes of the national economy the present system is the best way of raising the required revenue . . . *due regard being paid to the points of view of the taxpayer and of the Exchequer.*"[22] Also, the terms of reference were amended while the Commission was sitting so that it could indicate an order of priority, in so far as its recommendations would entail a loss of total revenue.

As a major instrument of change, the tax system can profoundly influence the course—and the effectiveness—of enterprise, both individual and corporate: for the benefit or detriment of the community and with or without justice to the owners of enterprise in a property-owning democracy.

While many are the points of criticism of the taxation system and while much should be done to improve it and to keep down the level of taxation, it is most important to recognize that controls and changes brought about by general schemes of taxation are tremendously to be preferred to direct controls administered by officials (no matter of how much goodwill and impartiality) on individuals, trades, industries, companies and groups, individually and selectively: such controls as price controls, capital issues controls, fixation of maximum wages, import licensing, permits and licences of multifarious kinds, applied, granted or withheld at the discretion of officials in respect of individual or group cases.

Controls of the latter kind constitute, even more than high taxation, the backdoor to an authoritarian and unfree society, and produce a flaccid economy. Taxation, if too high and falling upon production, energy and enterprise more than on consumption, is likely

[22] Italics not in original.

to have drastically undesirable consequences but the effects of direct controls are even more to be feared.

3. THE LITTLE-KNOWN LOW LEVEL OF COMPANY PROFITS

How high are company profits? Can the actual levels be determined? Although within the compass available here full demonstration is difficult, the conclusion can be indicated at the outset, viz. there seems strong *prima facie* evidence that Australian company profits, despite some zones where profits are high, have not been in recent years nearly as high as popular opinion seems to hold. In fact they have declined and seem to be low in absolute and real terms.

Company Profits and the National Income

In primitive communities there was virtually no capital and, consequently, living standards were low and even miserable. There being virtually no capital, profits would have been virtually nil as a proportion of the community income. This situation still exists in some present-day primitive societies. Material progress has depended greatly upon a steadily increasing total quantum of real capital in the community and therefore upon a long-term trend for profits (as payments for the use of capital to those who save part of their incomes instead of being total consumers) to become a higher proportion of the community or national income. Just as capital equipment and profits have raised the industrial society above the primitive, so more capital equipment and more profits distinguish the economies with high living standards from those at a lower level. An increase in profits—payments for use of capital—as a proportion of the national income does not mean that other kinds of real income are being reduced; the normal situation would be for all or most kinds of income to increase as a result of the productivity derived from the added capital; generally speaking, only a portion of the increased productivity remains with the owners of the capital as profit.

In England recently there has been much discussion about saving and re-investing a good proportion of the national income—of the order of 20 per cent of each year's national income —in order to keep on raising productivity. The conclusion is that as our communities increase their total wealth and capacity to produce so too, although subject to some modifying influences, will total profit of all kinds, if accurately measured, gradually increase as a proportion of the community income. It is the way of progress and it is to be hoped that it will take place on the basis of a "property-owning democracy". The trend for profit to rise as a percentage of community or national income could be disturbed if special or unusual influences operated, or if the rate of reward required for continued saving and investment were to become lower.

Let us examine the trend to use capital tools to reduce the work of men from a different aspect and consider what happens when a capitalist producer decides to make use of capital and machinery in place of manual methods. Take the case of a manufacturing company with a total annual sales revenue of £200,000 and a capital of £100,000. It is making a net profit of £16,666, or 16⅔ per cent on capital, before tax; and £10,000, or 10 per cent, after tax. The board accepts a recommendation by management to spend £20,000 on new machinery which will increase profits by £2,000, while reducing the quantity of work and probably the arduousness of the remaining work. In these examples output, sales revenue and the usage of materials are presumed not to change so that the effect of this kind of advance on the relative positions of profit and wages can be clearly seen free of complicating factors. The position before and after the additional mechanization is shown in the table on the next page.

It will be seen that (in the present state of company taxation in Australia) to spend capital to attain the same level of production by less laborious methods, while maintaining the rate of profit on total capital, the extra tax paid to the government is equal to two-thirds of the net profit made available to the owners in return for the extra capital they have provided. This illustration, therefore, helps to show in a simple example how taxation hinders progressive actions and thus further illustrates a major point made in part 2 under the heading of *Company Tax a Cost of Production Inhibiting Productivity*.

	Before additional mechanization		*After additional mechanization*		*Differences*
	£	£	£	£	£
Capital		100,000		120,000	+ 20,000
Production (in terms of sales revenue)		200,000		200,000	no change
Less Expense of:					
Wages	100,000		95,000		— 5,000
Materials	60,000		60,000		no change
Other items including depreciation	23,334		25,000		+ 1,666
		183,334		180,000	— 3,334
Profit prior to tax		16,666		20,000	+ 3,334
Less Expense of company tax ..		6,666		8,000	+ 1,334
Profit after tax		10,000		12,000	+ 2,000
	(= 10 per cent on capital)		(= 10 per cent on capital)		

As percentages of production (sales revenue):

Wages	50·0 per cent	47·5 per cent
Profits		
Prior to tax	8·3 „ „	10·0 „ „
Deduct tax	3·3 „ „	4·0 „ „
After tax	5·0 „ „	6·0 „ „

But the main purpose of this example is to show what happens to wages and profits as relative proportions of the final price. It will be seen that, as progress is made by the addition of more mechanical slaves, provided by the owners' capital, the relative importance of profit and of tax in selling price increases, while that of wages decreases. In the example tax increased from 3.3 per cent of production to 4.0 per cent and profit after tax from 5.0 per cent to 6.0 per cent. Wages fell from 50.0 per cent to 47.5 per cent. (The relative proportion of depreciation in selling price also must increase as more plant is employed per unit of output.) In the above statement the main items which become ingredients in the national income are wages and profits. Under full employment the men displaced by the mechanization will be employed in the same company or elsewhere, and let us assume (reasonably) that they receive the same wages in their new employment. (The additional capital is assumed to be new funds, either new savings or possibly new capital from abroad.) Then in the national income statistics we find the abovementioned main items taking effect as follows:

	Before additional mechanization	*After additional mechanization*
	£	£
Wages entering n.i.	100,000	100,000
Profit entering n.i.	16,666	20,000

It does not matter for the purposes of this illustration whether we use profit before tax, as is the practice of the national income statisticians, or profit after tax plus the tax—in both cases profit increases its weight in the national income.

There has been an increase of profit as a proportion of the national income without any loss to wage-earners. Total production in the community has been increased because this manufacturing enterprise is getting the same level of output and men have been able to go to other work, so increasing output elsewhere. It cannot be emphasized too much that greater output, once it exceeds the amount necessary to reward the additional capital, is available for the community in lower prices, higher wages, or in some other way.

A frequent result from this kind of mechanization increase would be not as used in this example for simplicity of exposition, viz. the same output for the same total cost (for all expenses and charges, income tax and profit), but a lower cost per unit of output at the same level of output (mainly due, perhaps, to greater savings in wages from the mechanization than postulated here), or lower cost per unit of output due mainly to a higher level of output. In such instances there is an immediate overall gain in productivity available for community use as indicated in the last paragraph.

We now turn to examine the trend of total company profits in Australia as a proportion of the national income.

The survey by Economic Services (Appendix 33) shows that, *since 1947*, company profits (before tax) and company dividends have held an almost stationary proportion of the national income. (It is a reasonable presumption, based on general evidence of capital-raising, that in this period companies have added to their capital, after allowing for depreciation, also that they have at least held their own with the rest of the community in the increasing of their capital resources and in pursuing progressive methods.)

If we go back to the prewar period we find:

	1938-39	*1953-54*	*1954-55*
"Company income" (prior to tax) as percentage of n.i.[23]	10.8	11.8	12.5

The points to note here are that, on first appearances, company income represents a somewhat higher proportion of the national income than before the war. But the comparison is not a true one. There are factors depressing shareholders' profits (distributed and undistributed taken together) not allowed for in this comparison and the result is that real company profits in 1953-54 and 1954-55 were less, as a proportion of the national income, than before the war, despite appearances.[24] The reasons why adjustments of these figures are necessary will now be discussed.

(a) The percentages of company income stated above are in all cases prior to tax. But company tax has now become a double tax because, irrespective of the size of the income of any shareholder, this tax of 7*s* (or 8*s*) is paid by the company and the shareholder receives no credit for it when his or her own tax is assessed. Before the war there was, generally speaking, a system of credits or rebates for the share-

[23] Figures calculated from the tables in *National Income and Expenditure* 1954-55.

[24] For the record: Leaving out minor qualifications, taxes on the profits of public companies in the immediate prewar period were imposed by the States at varying rates, and by the Commonwealth at about 1*s* 2*d* in the £. The overall average prewar tax seems to have amounted to almost 4*s* in the £. In 1953-54 and 1954-55 the tax on public companies was 7*s* in the £ and in 1956 was increased to 8*s*.

holder in respect of the tax paid by the company. Obviously, the tax of 7*s* or 8*s* in the £ applicable without an offset for shareholders, when previously there was an offset of company tax when shareholders were being assessed, means that the pre-tax income of companies has to be heavily reduced before it can be compared with the previous income of companies under the old taxation system.

(b) Adjustments for company tax can be made as follows:

	1938-39		*1953-54*		*1954-55*	
	£ million	*% n.i.*	*£ million*	*% n.i.*	*£ million*	*% n.i.*
National Income ..	£780m.		£3,842m.		£4,033m.	
Total company income (included in n.i.)[25] ..	£84m.	10·8%	£452m.	11·8%	£505m.	12·5%
Less income tax on companies[25]	£15m.	2·0%	£130m.	3·4%	£168m.	4·1%
Company income after company tax ..	£69m.	8·8%	£322m.	8·4%	£337m.	8·4%

An important point is that there has been a fall in company proprietors' share of the national income. Note, too, that (as a percentage of the national income) the owners of companies are contributing about twice as much to government income tax revenues as before the war, *although they are now contributing in full as persons as well* (and at the much higher rates now paid by everyone.)

(c) But the proper comparison with the prewar position has still not been made. We do not know how to make it arithmetically from available information but it can be indicated. The comparison shown in the last line of figures (of company incomes after tax as 8.8 per cent of national income in 1938-39 and 8.4 per cent in 1954-55) is still far from a valid comparison. The 8.4 per cent in respect of public companies will be fully taxed again, but a high proportion of the prewar 8.8 per cent was substantially tax-free, or lightly taxed, in the hands of the shareholders. *The true comparison would seem to be nearer to 10.8 per cent prewar, vis-à-vis 8.4 per cent in 1954-55.*

(d) Depreciation and stock valuations used in arriving at taxable incomes (taxable incomes form the basis of the national income statistics) are based on historical-cost accounting and result in profits being overstated in a period of inflation, as experienced in recent years, to a major degree. But, as inflation did not apply significantly in 1938-39, the profits (company income) would not then have been overstated. Therefore, for comparison of shares of the national income, 1938-39 versus 1953-54 and 1954-55, the official figures for the later years are too high. If a true comparison could be made incorporating these adjustments for stocks and depreciation, company profits in recent years would be even poorer in relation to prewar company profits than the above figures indicate. Perhaps a reminder can be given here that, as previously explained in these notes, this adjustment for depreciation and stock values is a correct one to make in computing the national income and shares of the national income. That large sums and important propor-

[25] Figures from the official *National Income Papers*. Company income in the *National Income Papers* excludes banks but income tax on companies includes tax on banks. Therefore for this tabulation income tax on companies has been reduced to take out, on a calculated basis, the tax on banks.

tions of the national income can be involved in these matters has also been demonstrated earlier in these notes.

We now turn to dividends to see if they confirm the trend indicated above. They do so. The comparison is as follows:

Dividends to resident persons as percentage of national income[26]

1938-39	3·2 per cent
1953-54	2·7 „ „
1954-55	2·9 „ „

Again the comparison is not true. The prewar 3.2 per cent was substantially tax-free or lightly taxed in the hands of the receivers. The lower recent figures of 2.7 per cent and 2.9 per cent are heavily taxed.[27]

In Australia it seems clear that company income, as a proportion of the national income, has declined distinctly, whereas the expectation would be for an upward trend to have occurred over the comparatively long term since 1938-39.

Real Returns to Shareholders from a Sample of Company Enterprise

Not long ago we made a study of the return from ownership of company shares based upon a group of well-known companies listed on the Sydney Stock Exchange. The period covered was thirty years, from 1924 to 1954, thus, by design, covering the depression and the postwar inflation.

The sample is not a randomized sample of public companies in Australia but covers 25 companies[28] which, taken as a whole and despite some gaps, we believe the ordinary investor would agree represent a reasonable cross-section of industry and trade in Australia as carried on by larger corporations over that period, including many of the "market leaders". Of course, many companies now prominent and successful were not prominent, and some not in existence, in 1924. Some companies then prominent have since failed and gone out of existence. The sample of companies covers banking, brewing, gas, insurance, pastoral industry and wool, retailing, shipping, steel, sugar, trusteeship, other manufacturing, and there are

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[26] Calculated from the *National Income Papers*; includes dividends received from overseas companies and excludes dividends remitted overseas.

[27] The difference between "company income" and "dividends" would seem to be comprised of: company tax; expenses not allowed for taxation purposes but deducted by companies before arriving at actual profits (including some measure of extra depreciation and stock value allowances, being costs not recognized under historical-cost accounting); profits held undistributed; and dividends paid to overseas shareholders, less dividends received by residents from abroad.

[28] The sample comprised the following companies:

The Adelaide Steamship Company Ltd.
The Australia Hotel Company Limited.
Australian Consolidated Industries Limited.
The Australian Gas Light Company.
Bank of New South Wales.
British Tobacco Company (Australia) Limited.
The Broken Hill Proprietary Company Limited.
Burns, Philp & Company Limited.
The Colonial Sugar Refining Company Limited.
The Commercial Banking Company of Sydney Ltd.
David Jones Limited.
Edwards Dunlop & Company Limited.
Farmer & Company Limited.
Goldsbrough Mort & Company Limited.
Kandos Cement Company Limited.
Mercantile Mutual Insurance Company Limited.
The Millaquin Sugar Company Limited.
Perpetual Trustee Company (Limited).
The Port Jackson & Manly Steamship Company Limited.
Sargents Limited.
Tooth & Company Limited.
The United Insurance Company Limited.
Washington H. Soul Pattinson & Company Limited.
Winchcombe Carson Limited.
Wunderlich Limited.

some representatives of mixed industry. Several factors limited the sample to 25 companies. One was that there are fewer companies of prominence which were listed thirty years ago than one would expect. Although there are some whose inclusion would have been possible, their inclusion might have unduly biased the sample towards certain industries. Some companies' affairs proved rather too difficult to follow through reorganizations of capital and reconstructions. An important factor was the surprisingly large volume of work in collecting data and making calculations, and we concluded that the sample we had was good enough and extensive enough to indicate in a broad way the trend for this class of public company.

The method of assessing the results is now described. The calculation assumed an equal original investment in each company and the purchase of the shares at stock exchange prices at 30 June 1924. The investment on which the return was calculated consists of the cost of the purchase, plus the cost of new issues (all presumed taken up) in cases where new issues were made requiring subscription of capital, or less the sum received where capital was returned. On the income side all dividends payable on the shares after 30 June 1924 were taken into account, including dividends on bonus shares and on other new issues. The investment and the income were corrected by means of the "C" Series Index to a common currency value, viz. 1954 £s. For the final result the average corrected dividend over the period was divided by the average corrected investment. The final average of the results for the 25 companies is a weighted average. The weight given each company is the average investment in it over the whole period. Although original weights were equal, new issues and other capital changes altered the average investment over the period. Naturally, the return shown by the computation as a whole is affected by the stock exchange values at 30 June 1924. (In respect of capital gain or loss the result is affected also by the stock exchange value at 20 June 1954.) The data were obtained and the calculations made by a retired chief accountant of C.S.R. The method was then examined by a senior statistician and the calculations checked by computers working under his supervision.

A further calculation was done on the assumption that all shares were realized at stock exchange values at 30 June 1954. Surprisingly, this showed that there was a small loss—and not a gain—from the change in the capital value (market value) of the shares, after correcting for the fall in the value of the currency. The value of new issues of all kinds, including bonus issues, was included in the capital value as at 30 June 1954. The capital loss, thus expressed in real terms, was equivalent to an annual reduction of dividend of 0.4 per cent. (Since 30 June 1954 the Sydney Stock Exchange index of the market value of ordinary shares has shown, to the time of writing, a very slight increase, but more than offset by the fall in the value of money since June 1954.)

While perhaps the results for any one company, if treated in the way described, would have little meaning except for the hypothetical investor who bought on 30 June 1924 and sold at 30 June 1954, it does seem that the results of the 25 companies are broadly indicative of the trend in these matters. The results for any single company could incorporate a distortion because the market value of its shares at specific dates might be considerably affected by expectations of the moment, by reports of short term effect and even by rumour. The use of a sample of 25 companies should make such distortion negligible.

The same calculations were carried out in money terms, uncorrected, so that these monetary and uncorrected results could be compared with the real results. The results for the thirty years were:

Average return per annum for 25 companies 30 years—1924-54

	Uncorrected	*Real*
Average dividend p.a.	6.8 per cent	6·0 per cent
Capital gain (+) or loss (—) expressed, like the dividend, as percentage p.a. of average investment	+ 4·5 per cent	— 0·4 per cent
Overall Result	11·3 per cent	5·6 per cent

The salient point is that over thirty years the real dividend has been 6.0 per cent per annum *and there has been a loss of real capital.*

A similar exercise was carried out for the period of 17.3 years from February 1937, the base date used by the Federal Arbitration Court when raising monetary wage margins by the "2½ times formula". The original investment for this period was taken at then current stock exchange values. Otherwise the method was the same and the sample of companies was identical. The results were:

Average return per annum for 25 companies 17.3 years—1937-54

	Uncorrected	*Real*
Average dividend p.a.	4·6 per cent	3·2 per cent
Capital gain (+) or loss (—) expressed, like the dividend, as percentage p.a. of average investment	+ 1·9 per cent	— 2·9 per cent
Overall Result	6·5 per cent	0·3 per cent

For this period the investment in every company showed a loss of real capital.

It is worthy of comment, too, that since 1940 the investors would have had to pay full personal income tax on the dividends. It is obvious, therefore, that over the period of 17.3 years the overall net result, after payment of personal taxes, must be a minus quantity.

This study of the results of 25 companies, as representative of the more prominent corporate capitalist enterprises in Australia, helps to an understanding of the great disparity between the real economic position and nominal appearances. The effects of failing to account for inflation are large. It also indicates that financial rewards for investors in corporate capitalism are at a much lower level than many suppose, even over a long period; and that they have been exceptionally low since the immediate prewar period.

For comparative purposes the results were calculated for a 5 per cent Commonwealth Government loan, purchased on the market at 30 June 1924, converted at a small discount to a 4 per cent loan in 1931, converted again at par to a 3⅛ per cent loan in 1951, and sold on the market on 30 June 1954.[29] The results for the thirty years were:

Average return per annum for Commonwealth Loan 30 years—1924-54

	Uncorrected	*Real*
Average interest p.a.	4·2 per cent	4·0 per cent
Capital gain (+) or loss (—) expressed as percentage p.a. of average investment	— 0·2 per cent	— 2·0 per cent
Overall Result	4·0 per cent	2·0 per cent

For the period of 17.3 years the results were:

Average return per annum Commonwealth Loan 17.3 years—1937-54

	Uncorrected	*Real*
Average interest p.a.	3·8 per cent	2·8 per cent
Capital gain (+) or loss (—) expressed as percentage p.a. of average investment	— 0·6 per cent	— 3·8 per cent
Overall Result	3·2 per cent	— 1·0 per cent

[29] Conversions based on an actual experience. Values: 30 June 1924, 7th War Loan market price £95 10*s* 0*d*. 30 June 1954 3⅛ per cent loan due 1961-64 market value £90 1*s* 3*d*.

4. PRICE CONTROL AND OTHER DIRECT CONTROLS

Price controls are required in some circumstances, war being the clearest example. In wartime it is necessary to allocate and ration resources, of men and labour as well as of materials. In those circumstances price control is necessary to hold in check profiteering and inflation and to prevent the diversion of resources needed to prosecute the war. But price controls are only part of the whole range of controls and would be comparatively ineffective on their own. The general system of controls includes other and more powerful controls: the allocation or rationing of materials; the allocation and direction of labour; and, of course, fixation of maximum prices for the most important price in the community, viz. wages, the price of labour.

The great majority of the individuals who make up the community tolerate these conditions because personal and individual goals are placed in the background; the great majority do their best, in the interests of the survival of their society, not to allow such controls to reduce output and production. In normal times these wartime attitudes do not operate and the deeply rooted urge of the individual man to make personal progress and to obtain personal recognition comes to the fore. The way in which this personal urge works in the interest of the community has been referred to in several places in this book; and its reconciliation with the interests of the community has been more particularly discussed in *Corporate Capitalism in a Mixed Economy*, part of Chapter 15, *The Rewards of Enterprise*. It is there pointed out that society needs the energy, vitality and drive which flow from this personal urge.

Most of the price fixing that Australia and New Zealand have experienced since the last war has been, in practice, no more and no less than fixation of profit. And the fixation is generally by reference to a percentage margin on the "funds employed", calculated to return, in current £s, a net income equal to that percentage of the amount of historical money invested.

If, because of this method or of any other method employed by the price control authorities, the level of profits is set on the low side, as has often been the case, the producer loses interest. The producer's reaction is to divert his capital resources, vitality and know-how to other fields where he can profitably apply his urge to use his resources and energies to gain satisfactions for himself—both material satisfaction and the non-material satisfaction of making progress and achieving something worth-while by exercise of his efforts. And these satisfactions apply to the directors and managements of corporations in the same way as to individual entrepreneurs. The more impatiently enterprising the outlook of the producer, firm or business, the greater and quicker the tendency to turn to other fields. If the producer does not transfer his attention in this way then he simply "takes it easy", with the inevitable results on productivity and efficiency.

If withdrawal and transfer are for the time being difficult, the producer keeps going temporarily in the price-fixed field, but this tends to be in a disinterested way, while he looks around and plans other moves. In the price-fixed field efficiency begins to slacken, costs rise and customer service deteriorates. This is the trend although the more conscientious and public spirited producers struggle against the tendency. For little the producer can do will bring him worthwhile advantage of any kind; even more importantly, he experiences a feeling of injustice, under which human beings, although they may keep plodding, will not give of their best. On the material gains side, if the producer puts more effort and organizational skill into efficiency and, as a result, profit rises, it is a momentary rise because, under price control, the theory and the practice is that this is taken away from him in full by decree.

Therefore, in price-controlled zones—and price control tends to be applied to goods of the most importance to the community—costs tend to rise. Short-sighted people feel happier with the thought that profits are low; they do not appreciate that the costs will rise and that, in final prices, costs are many times more important than profits.

The instincts and motivations of people as producers and entrepreneurs, whether sole operators, partnerships or corporations, have several basic similarities with those of people who work as wage-earners. They all look for progress, rewards, recognition. It is accepted that it is no use expecting a wage-earner to work harder and give greater output unless he obtains reward of some kind: material reward, more recognition, higher status or acclaim. If there is a difference between the wage-earner and the entrepreneur it is that the activity of the entrepreneur is probably more stimulated by rewards and more depressed by the lack of them. Another difference is that the effects for the community of failure in entrepreneurship are greater.

Exceptions can occur to the process of withdrawal from price-fixed zones. They are mostly partial or temporary exceptions. If the profit margin is set at a "normal" or "above-normal" rate, *in the judgment of the producer,* he will probably retain his interest or a good proportion of his interest in efficiency and productivity. His interest could even be enhanced. He may invest more capital or plough back some of the earnings. However, the practical man with a wide-awake view will probably prefer to use some of his available funds and energy to spread his activities. It is a question of confidence. If he has confidence in the future of the price-fixed industry, and in the future views and actions of the price fixers, he will increase his interests and commitments in the price-fixed zone. But his confidence is unlikely to be high except in rare instances, because experience teaches that the profit margin rests on the insecure basis of an official decree. Official decrees of this kind are different from the kind of long-term traditional laws that let everyone know their rights over a long period and are unlikely to be hastily or capriciously varied. Price-fixing decrees are apt to be varied overnight, and politics, with their viewpoint of short-range expediency, party interest and the next election, are always present close behind the official. If the producer is satisfied that his group has sufficient political influence he may go ahead optimistically and with a feeling of confidence. An example of this latter situation in industry other than primary industry does not come readily to mind. But there is an example in respect of farm production in the United Kingdom in postwar years. There both political parties have had a policy of "encouragement prices" for farm production, in order to make the United Kingdom more self-sufficient in food. But, additionally, the farmer vote is most important and the farmers have been highly-organized and most articulate.

Another partial or temporary exception to the trend to withdraw from price-fixed zones may be found in the many-unit industry, where prices have probably been fixed by reference to average-cost or marginal-cost producers, and some producing units will be more fortunate or more efficient than others. The latter may expand optimistically for a while and, if marginal producers continue to be used as the basis for prices, this situation could constitute a major exception extending over quite a long period.

Producers more often than not possess a deep interest in and a feeling for their established industry and established line of goods. Besides, it is the "game they know" and they are reluctant to leave it. Some, thinking optimistically that matters will improve or that "commonsense will prevail",will contemplate and even carry out decisions to expand or spend capital that are really acts of faith. These examples are exceptions or partial exceptions to the trend of events under price control, but they do not alter the trend if the same kind of control continues.

The process of withdrawal from price-fixed zones and industries is not necessarily rapid or easy. Capital in stocks of goods and debtors is often fluid and mobile and can frequently be withdrawn and transferred in a comparatively short time. But capital in fixed assets (buildings, plant and heavy machinery) is generally quite rigid. This kind of capital provides from the price fixers' viewpoint an ideal hostage, which they have not been slow to see and exploit. Even in respect of fixed capital, however, the tendencies and results are the same even if the time sequence takes longer. Maintenance continues, at high cost, of plant that in more normal circumstances would be replaced with plant of improved performance. Attempts, except on the grounds of conscientiousness which do tend to persist for a time, to reduce labour or other operating costs come to seem not worth while. There is a gradual running down of efficiency. Little new thought, money or enterprise goes into dead zones—

as with sandy, eroding, wasting farm land in drought areas, where the farmers steadily withdraw and potential new ones turn aside after the first brief casual inspection.

While fixed capital has to "take it" longer under price control than fluid capital, it is all the harder, after such experience, to restore confidence in order to obtain reinvestment of fixed capital. It becomes loth to place itself again in the position of a hostage.

Where price fixing is imposed on one or a few firms, or on a specific line of goods and services, in a way that reduces profit below the level which entrepreneurs and investors, *in their own judgment*, consider they require, the results are most direct. There is less room to manoeuvre temporarily than in the many-unit industry. As and when the capital resources can be extracted and employed elsewhere this is done, except in the cases of acts of faith and optimism. Enterprise is killed off rapidly—and with it innovation and tendencies towards economic growth.

The fields to which capital and human enterprise tend to transfer under price control are often the less socially-important activities: speculative trading and opportunistic activities of less permanent social value. A premium is put upon the high, quick return, upon keeping the funds fluid, upon avoidance of commitment to long-term investment and fixed assets of production which might be subjected to unenlightened price control.

Probably rent control is the clearest example of the tendencies of price control. Here the efforts of governments have been directed not so much to the prevention of profiteering in rent as to forcing owners of rentable housing, as a section of the community, to carry a considerable and undue share of the burden of community costs and problems. This has seemed politically expedient on the basis of the short view or of party or sectional interest. It was easy to apply and maintain because the asset was fixed (the hostage firmly held) and the owners were neither politically organized nor articulate. Rent control is referred to here because in it one sees with great clarity the "classical" features of price fixing—and particularly its effects. One effect is that capital and entrepreneurship have been withdrawn from housing; the supply of housing has not increased as it would have in more normal conditions and the housing shortage has persisted. To a considerable degree competitiveness and enterprise went out of house construction. Governments have tended more and more to fill the gap and a distinct impetus has been given to statism and higher taxation.

In some respects there is found under price control a situation similar to that existing under high levels of income tax. The situation, however, is found in a worse form because price control is operated in an entirely discretionary and arbitrary way and there is no appeal; also because price control limits the whole of the profit—not taking a proportion of it only, even if a high one. As nothing the producer can do will bring him any significant gain price controls have a greater effect than high taxation in raising costs and checking progress.

The price fixers often work, too, on the income tax methods of accounting, which means historical-cost accounting, historical-cost depreciation, no adjustment of stock values for higher replacement costs. The effect of these methods is to overstate the amount of profit. This exaggerated amount is then usually brought into percentage relationship with historical-cost capital (or historical-cost shareholders' funds) which, by comparison with current values, is an understatement. The percentage resulting from a bringing together of an overstated profit with an understated amount for capital employed in earning the profit is disastrously astray. By divorcing the situation of business and production from economics, in accordance with convention, price control officials make the percentage figure for profit appear high even when in economic fact it is low or very low. And price control officials, in the opinion of businessmen, are apt also to have very low ideas of reasonable percentage profits and so they make orders forcing the profits down still further. Hard to believe matters can be as bad as that, is it not? Nevertheless each of those three depressing factors do operate under price control: overstated profit, understated capital, low allowable percentage.

The chief popular appeal of price control has been located in a vague and uninformed belief that it makes for equity and that it has the capacity to counteract inflation. In truth it secretly fosters inflationary forces while covering them up and nourishing the growth of

costs. But the growth of higher costs is hidden from sight and is therefore not appreciated. In short, price control is, in fact, a strong and insidious inflationary force.

Most of the price control known in Australia and New Zealand has devoted its attention to the symptoms of high prices and inflation. It does nothing effective to remove the causes; rather, it aggravates the causes and so makes cure more difficult. When a boiler is blowing off steam one does not promote progress and safety by screwing down the safety valve and thus removing from sight and hearing warning signs of the dangerous (inflationary) pressure.

Controls that do not go beyond constituting reasonable anti-profiteering measures could, in theory, be a different matter from continuing direct decree-law price and profit control as recently experienced in Australia and New Zealand. A form of control that could serve the public interest (in situations where some control is unavoidably required) is one which gives pride of place to the removal of restrictive practices, the increasing of productivity and the reduction of costs. For reasons discussed in these notes and in Chapter 15, this means that what are required are policies which will work *in the opposite direction to traditional price controls* by inducing the use of more tools of production, more capital and the application of more innovation and more entrepreneurship. And these require adequate material rewards; the keeping by the producer of a share of the gains from higher efficiency; and the avoidance of any sense of working in or for an organization or institution that is made to feel itself to be the occupant of an invidious position—where human beings feel that they are operating in a way that does not enjoy the approval of society.

On the matter of financial rewards and assessments of costs, the accounting, to attain the ends just described, would have to account for inflation. There is no sign of an "atmosphere of approval", or feeling of justice, where rewards to those who save and invest do not make allowance for the fall in the value of money, while other sections of the community achieve adjustment for this decline. In today's inflationary circumstances capital and rewards therefor are no longer legitimately assessable in terms of the monetary cost of assets in prewar £s or even in £s of six years ago. The factor that counts in income is current £s, as is recognized in other spheres, especially in respect of wages. Shareholders and management have the same feelings on this matter and the same "rights", if rights there be, as wage-earners.

It is interesting that the United Kingdom Monopolies Commission is instructed, by the Act constituting it, to have regard to "the organization of industry and trade in such a way that their efficiency is progressively increased and new enterprise encouraged". This instruction is consistent, at any rate in theory and ideal, with Keynes's belief in the value of "enterprise" and "animal optimism" as factors which benefit the community as a whole. The instruction requires a level of rewards that will attract new capital and initiative. Where enterprise and optimism are discouraged, or prohibited from existing, by the nature of imposed controls, the benefits to the community wither away.

There is no prospect of business which comes under the more common forms of price control known in Australia and New Zealand being a pace-setter of economic progress. Pace-setters may perform well with reins to guide them and under encouragement. They cannot perform if kept in hobbles, uncared-for and under-nourished; and if placed in a position where optimism, one of the most important of all factors for growth and progress, cannot survive.

The Australian Ministry of Labour Advisory Council said recently,[30] ". . . the best assurance of productivity growth probably lies in preserving an economic climate in which rewards, whether of employers or employees, depend on efficient performance."[31] A corollary is that,

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[30] See *Productivity*, Department of Labour and National Service, Melbourne, 8 March 1956.

[31] It is to be noted that price fixation means fixation of *maximum* prices and this in turn usually takes the form of limitation of profit; rewards for higher efficiency are ruled out by decree. The fixation of wages in Australia and New Zealand is of *minimum* wages. There is nothing to prevent employers and employees arranging for higher wages than the legal minimum and this, in fact, is often done; in its most beneficial form the higher wages are linked to better performance and higher output. But employers are naturally disinterested where their shares of the gains from greater productivity are prevented by price control from accruing to them.

fundamentally, an adequate level of rewards should not be withheld or prevented unless performance is inefficient. And the problem then would be to stimulate improved performance.

Price controls in peactime—other than for a short transitional postwar period—are generally indicative of a static or sick society. There are many examples of this in history.[32] The real problem for a society is to work upon the fundamental causes of a situation that leads the society even to contemplate price controls.

Price controls entail too many direct and inherent disadvantages to be a useful economic tool in peacetime. In any case they do not, alone, have continuous worth-while effects, but they have many deleterious ones. For effectiveness there would have to go with them other controls, allocation of resources and positive fixation of wages—for wages, although they have characteristics which distinguish them from other prices, are, in effect, the most important price of all in the economic situation. If inflation could be beaten by price controls (which the writer does not believe) obviously the most important step would be to fix *maximum* wage rates. To be effective the fixation of wage rates would almost certainly need to be followed by the direction of labour and of other resources. With these, the situation would go from bad to worse; general stultification of free effort and free enterprise would result; and only the supporters of the strongest forms of statism wish to see such a condition of affairs.

It is encouraging that Australia and New Zealand have moved away from price control. This could be a step towards policies that will stimulate productivity and attack the causes of inflation; towards policies that will focus attention on causes instead of simultaneously hiding and fostering them underneath price control; towards policies opposed to "static thinking" and the "Maginot mentality"; towards policies of practical economic and social dynamism.

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[32] For instance, most historians dealing with the decline of the Roman Empire give attention to the economic disorders; and to them as results of a deeper malaise. "The economic evils have their root in moral apathy and paralysis of human will," says De Burgh in *The Legacy of the Ancient World*. Barrow in *The Romans* says: "One of Diocletian's most urgent tasks was the reform of the currency in order to check inflation. Closely connected with this was his attempt to fix maximum prices for goods and services. The edict . . . defines the prices for such things as food, timber, leather, textiles, cosmetics. . . . It fixes the rates for workers, such as shipwrights, silk and wool workers, painters, primary and secondary schoolmasters, and determines a schedule of freight rates; goods on government account were to be carried at cheaper rates. . . . For the purposes of state, work must be done—'essential work'. And so labour and skill were not merely 'directed' but were tied down to the field or bench or dockyard or office. . . . Factories were nationalized. [etc] . . . Thus, there was no incentive to enterprise or initiative or saving; the state effectively killed them all. Production fell, and with it the standard of living; the rigid uniformity of a lifeless society and static mediocrity prevailed. The price of security was the absorption of the individual by the state. . . . In the sphere of government and public life the old ideals have passed away, though the names remain a shadow without substance . . ."

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APPENDIX 2 EXPLANATORY NOTES

Megass—is the most commonly used term in C.S.R. mills for what is more widely known as *bagasse*. It is the residual fibre left after crushing cane and extracting the juices.

Money Values—unless otherwise stated, are expressed in the currency of the country under consideration, i.e., £F (Fijian pounds) and £NZ (New Zealand pounds) in the respective chapters dealing with those countries, and £A (Australian pounds) elsewhere in the book.

Mean exchange rates on 1st October, 1955, were:

£F100	=	£A112.1.3
£NZ100	=	£A124.5.5
£Stg100	=	£A125.5.0
£A100	=	U.S. $222.45

Net Titre (or N.T.)—is a measure of the commercial value, for refining purposes, of a raw sugar. It is calculated by an empirical formula from the chemical analysis of the sugar. For payment and statistical purposes the equivalent tonnage of sugar at a common standard net titre is used. In Australia and Fiji raw sugars are assessed on a 94 N.T. basis (e.g., 100 tons 96 N.T. sugar is assessed as $100 \times \frac{96}{94}$ tons of 94 N.T. sugar).

P.O.C.S. (Pure Obtainable Cane Sugar)—This is a figure calculated from the analysis of cane and forms a basis for assessment of the percentage of cane sugar recoverable under specified conditions of manufacture. P.O.C.S. and C.C.S. (Commercial Cane Sugar) are the same. See also Appendix 23.

Polarization—A measure of the percentage cane sugar (sucrose) content. It is determined by use of the saccharimeter (or polariscope), an instrument which measures the amount of sucrose in a solution by the degree of rotation of a ray of polarized light passed through the solution. In many countries the polarization is used as the measure of quality for adjustment of the price of raw sugar.

Ratoon—A subsequent crop of cane sprouting from the stumps and roots remaining in the ground after harvesting.

Stool—The cluster of cane stalks arising from the planting of a cutting or sett, or from a ratoon regrowth.

Sucrose—is cane sugar ($C_{12}H_{22}O_{11}$).

Tel quel—means "as is". For statistical and commercial purposes raw sugar is generally assessed according to some accepted standard of quality such as 96% polarization or 94 N.T., but in some cases weights of raw sugar "as it comes" are taken and such weights are generally designated *tel quel*.

Weights—Unless otherwise stated, tons means long tons of 2,240 lbs.

APPENDIX 3 ACTIVITIES OF THE COLONIAL SUGAR REFINING COMPANY LIMITED

Sugar refining ...	C.S.R. is the main sugar refiner in Australia, owning 5 of the 6 Australian refineries, and is the sole refiner in New Zealand.
Raw sugar milling ...	Seven of Australia's thirty-four raw sugar mills are owned by C.S.R., which makes about one-fifth of Australia's total raw sugar. The company also owns five raw sugar mills in Fiji, where it is now the only mill owner.
Sugar marketing ...	C.S.R. markets most of the refined sugar consumed in Australia and all in New Zealand and maintains branch offices in Auckland, Brisbane, Melbourne, Adelaide and Perth. The company also markets all Australian and Fijian raw sugar exported, and procures raws from abroad for New Zealand.
Distilling	C.S.R. distilleries at Sydney and Melbourne ferment molasses and distil industrial alcohols and rum.
Building materials manufacture	C.S.R. makes Cane-ite, Timbrock and Gyprock wallboards, asbestos cement products, floor tiles, ceiling tiles and building plaster, and owns asbestos and gypsum mines.
Industrial chemicals manufacture	C.S.R. has a sixty per cent holding in C.S.R. Chemicals Pty. Ltd, manufacturers of a large range of industrial and pharmaceutical chemicals.
Shipping ...	Three C.S.R. general cargo and molasses carrying vessels ply between Australia, Fiji and New Zealand.
Research	The C.S.R. research establishments constitute probably the largest non-government research organization in the South Pacific. There are C.S.R. research laboratories in Sydney and field experiment stations in N.S.W., Queensland and Fiji.
Agricultural advisory service	In all C.S.R. mill areas the company maintains a staff to advise farmers on matters associated with cane cultivation.

APPENDIX 4 SUGAR IN THE SOUTH PACIFIC 1787-1955

A Chronological Summary

1787 The First Fleet shipped, at the Cape of Good Hope, "the fig-tree, bamboo, Spanish reed, sugar cane" and many other plants, seeds, vines and grain.

1788 Lieutenant Philip Gidley King, Commandant at Norfolk Island, reports to Governor Phillip "the sugar cane thrives very well".

1802 First beet sugar factory starts in Silesia, Germany. Beet sugar production was later to have a serious effect upon the fortunes of the South Pacific sugar industry.

1811 Napoleon Bonaparte takes steps to develop the European beet sugar industry.

1817 Thomas Alison Scott is said to have brought to Sydney Botanic Gardens, from the Society Islands, the first sugar canes known to have been planted on the Australian continent.

1823 Scott makes a small quantity of raw sugar from Australian-grown canes. This was the first raw sugar to be produced in Australia.

1827 Scott makes some tons of raw sugar at the penal settlement of Port Macquarie, from cane grown in the district.

1839 Australian Sugar Company formed in London to refine imported raw sugars in Sydney. (This company erected a refinery at Canterbury, but was dissolved before factory commenced operations.)

1840 All sugars for Australian colonies imported. Official statistics for Port of Sydney for year 1840 (recorded in manuscript) show imports of Mauritius, Java and Manila "moist" sugars (5,183 tons) and imports of "refined" from Great Britain and U.S.A. (1,195 tons).

Edward Knox arrives in Sydney.

South Sea Islanders used as shepherds at Twofold Bay, N.S.W., during the 1840s. This was probably the first time Kanaka labour was used in Australia.

1842 Australasian Sugar Company formed in Sydney to take over the assets of the Australian Sugar Company.

The Canterbury refinery commences operations, processing imported raw sugars and producing the first locally refined sugar in Australia.

1843 Edward Knox appointed manager of the Australasian Sugar Company, at the age of twenty-four.

1847 Sugar canes grown in the Botanic Gardens, Brisbane.

1854 Australasian Sugar Company dissolved.

1855 Colonial Sugar Refining Company formed in Sydney, taking over some of the assets of the Australasian Sugar Company. The Canterbury refinery was closed down. The new company bought the "Brisbane House" refinery in Parramatta Street.

1857 Victoria Sugar Company formed in Melbourne, by C.S.R. shareholders and Victorian business interests.

1857-1858 Serious depression in the sugar trade. C.S.R. in financial difficulties.

1862 John Buhôt makes a small quantity of raw sugar; the first to be produced in Queensland.

1863 Captain the Hon. Louis Hope has 20 acres under sugar cane, largely from seed canes obtained from T. A. Scott.

First shipment of Kanakas to arrive in Queensland, sent to Captain Robert Towns's cotton plantation. As cotton failed, Kanaka labourers were recruited for the Queensland sugar plantations.

1864 Sugar and Coffee Regulations enacted in Queensland to encourage these industries.

1864-1867 Attempts to grow cane and manufacture raw sugar in N.S.W. Very primitive equipment.

1865 Capt. Louis Hope opened the first commercial-scale sugar mill in Australia at Ormiston, near Brisbane.

1868 Richard Meares's steam-driven mill on the Hastings River operating; this was the first reasonably efficient mill in New South Wales.

C.S.R. sends Melmoth Hall to the northern rivers of N.S.W. to examine prospects for establishment of centrally situated mills to purchase cane from independent small farm growers. This was a revolutionary departure from the prevailing system of each plantation operating its own mill. C.S.R.'s original plan was "to pay for the cane on a scale proportionate to the quality of the juice", but this was found impracticable at that stage.

C.S.R. announces by advertisement that it is prepared to establish central sugar mills on the northern rivers of N.S.W.

1869 E. W. Knox appointed manager of the northern rivers (N.S.W.) mills.

1869-1870 C.S.R. erects and operates three large sugar mills on the Macleay and Clarence Rivers, N.S.W. (No coloured labour was employed by C.S.R. at its N.S.W. mills.)

1873 C.S.R. gives prizes to a total value of £1,000 to farmers whose canes bear evidence of careful cultivation.

Darkwater Mill transferred from the Macleay River to the Clarence River. It was renamed "Harwood Mill". (C.S.R.'s Harwood Mill on the Clarence River, still operating in 1955, is the oldest working sugar mill in Australia.)

1875 Victoria Sugar Company's refinery in Melbourne destroyed by fire. The company immediately purchases Joshua Brothers' refinery at Yarraville.

1876 E. W. Knox visits West Indies to study milling methods. His visit resulted in the adoption of "double-crushing" at C.S.R. mills.

1878 C.S.R. opens a large, new sugar refinery at Pyrmont, Sydney.

1879 C.S.R. appoints its first chemist to do sugar analyses. First indentured Indian labourers arrive in Fiji.

1880 E. W. Knox appointed General Manager (aged thirty-three).

C.S.R. opens Condong Mill on the Tweed River, N.S.W., buying cane from small farmers in the district.

1881 C.S.R. engages T. U. Walton, sugar chemist from Greenock, Scotland.

C.S.R. opens Broadwater Mill, on the Richmond River, N.S.W., buying cane from small farmers in the district. Broadwater was described at the time as "the most important sugar factory, not only in this Colony, but in the whole of Australia".

1882 A system of chemical control of processes commenced in C.S.R. mills. C.S.R. led the Australian industry in this respect and most, if not all, other cane sugar industries of the world.

Nausori Mill opened on the Rewa River, Fiji. This was C.S.R.'s entry into sugar production in Fiji. Cane purchased from local planters as well as being obtained from mill plantation, worked with indentured Indian field labourers.

Millaquin Refinery commences operations at Bundaberg, Queensland.

1883 Homebush Mill (Mackay, Q.) and Victoria Mill (Herbert River, Q.) opened by C.S.R. on behalf of the Victoria Sugar Company. Some of the cane supply bought from independent farmers.

New Zealand Sugar Company formed in Auckland. Equal shares held by C.S.R., Victoria Sugar Co., and New Zealand business interests.

1884 Chelsea refinery in Auckland, N.Z., commences work. Built by C.S.R. for the New Zealand Sugar Company.

1884 Habana Mill near Mackay, Q., commences subdivision of its plantation into small farms for leasing to cane growers.

Sugar prices slump because of dumping of subsidized European beet sugar on world markets.

1885 166 sugar mills in Queensland and 102 in N.S.W. Many of these mills disappear during following years of depression.

C.S.R. lays down its first fertiliser trials, using sulphate of ammonia and superphosphate.

Goondi Mill, on the Johnstone River, Q., opened by C.S.R.

Pacific Islanders Act passed by Queensland Government, prohibiting importation of Kanakas after 1890. This prohibition was repealed in 1892.

1885-1888 Dr G. Kottmann, C.S.R. chemist, evolves the "P.O.C.S." formula for determining the "pure obtainable cane sugar" in cane. (C.S.R. had by this time established a comprehensive system of chemical control in its factories.)

1885 Sugar experiment station established in Louisiana, U.S.A.

Soltwedel in Java produces a few seedling canes.

1886 Sugar experiment station established in Java.

C.S.R.'s first cane nursery established at Harwood Mill.

C.S.R. analyses soils for the first time.

Rarawai Mill, Fiji, built by C.S.R. for the New Zealand Sugar Company, commences work.

1887 C.S.R. constituted a limited liability company.

Amalgamation of C.S.R. and the Victoria Sugar Company.

1888 Amalgamation of C.S.R. and the New Zealand Sugar Company.

Royal Commission on the Sugar Industry reports: "If all coloured labour is withdrawn, extinction of the industry must speedily follow."

First two Government-sponsored central co-operative mills (Racecourse and North Eton) commence operations in Mackay district. These mills were supplied with their cane by local farmers who were members of the co-operative.

C.S.R. commences green manuring.

Soutter, of the Queensland Acclimatization Society, Brisbane, raises 4 seedling canes.

1889 Harrison and Bovell, in Barbados, produce seedling canes.

1890 C.S.R. commences breeding canes from seed.

Italian immigrants commence work on sugar plantations on the Herbert River, Queensland. These were the pioneers of the Italian families who now own many farms in northern Queensland.

1891 C.S.R.'s Keith Hall estate, Richmond River, first used as a field experiment station.

C.S.R. opens Glanville refinery, Adelaide.

1891-1892 C.S.R. cuts up its Queensland cane estates at Homebush and Victoria Mills into small farms for leasing to selected growers with right of purchase, thus extending the policy it had introduced in N.S.W. twenty years earlier.

1893 C.S.R. works with N.S.W. Dept of Agriculture to combat "gumming disease".

Sugar Works Guarantee Act passed by Queensland Government, authorizing establishment of additional central co-operative mills with government assistance.

New Farm refinery opened in Brisbane by C.S.R.

1894 C.S.R. opens Lambasa Mill, Fiji.

World depression causes heavy fall in sugar prices.

1895 Childers Mill, built by C.S.R. near Bundaberg, Queensland, commenced operation.

1896 H. Tryon sent to New Guinea by Queensland Government to collect sugar canes. He brought back the famous *Badila* cane.

Macknade Mill, on the Herbert River, Queensland, bought by C.S.R. from Messrs Neame.

1897 C.S.R. purchases Hambledon Mill, Cairns, Queensland, previously owned by Swallow and Derham.

1899 C.S.R. commences purchasing cane according to its sugar content as determined by analysis, using P.O.C.S. formula.

1901 Bureau of Sugar Experiment Stations established by the Queensland Government. The Government had, however, established nurseries for sugar cane and other tropical plants much earlier.

Federation proclaimed. Protective duties placed on sugar. Excise and rebate system established to foster "white-grown" sugar in Australia.

1901 *Badila* cane commercially grown for the first time.

1903 Lautoka Mill, Fiji, opened by C.S.R.

1904 *Clark's Seedling*, the first significantly successful "commercial" variety of cane bred by C.S.R., is produced.

Bureau of Central Sugar Mills established by Queensland Government to regulate the affairs of Government-sponsored central mills in debt to the Treasury.

1906 C.S.R. disposes of several Fiji plantations to its "officers who wish to strike out for themselves".

Deportation of remaining Kanakas.

1907 Australian Sugar Producers' Association founded in Queensland.

1908 C.S.R. sends its first expedition to New Guinea to search for sugar canes (Dennis and Blaxland).

1912 Queensland Government sends T. W. Wells to New Guinea to collect canes.

Report of Royal Commission on the Sugar Industry (Chairman Sir John Gordon and, later, W. Jethro Brown).

1914 C.S.R. sends its second expedition to New Guinea to collect sugar canes (Carne and Baker).

1915 Commonwealth Government takes over control of the sugar industry as a war measure. The Sugar Acquisition Act passed by the Queensland Government.

Regulation of Sugar Cane Prices Act passed by the Queensland Government, providing for the fixing of prices of sugar cane in accordance with the "Commercial Cane Sugar" content of the cane. The formula for "C.C.S." as defined in the Act is identical with C.S.R.'s original "P.O.C.S." formula.

1920 All existing indentures of Indians in Fiji cancelled by Government decree.

1921 C.S.R.'s Homebush mill at Mackay, Queensland, closed on completion of season.

1923 Commonwealth Government hands over to the Queensland Government control of the sugar industry in that State. Queensland Government makes refining and marketing agreement with C.S.R.

1924 C.S.R. introduces its "tenant-farming" system in Fiji as a possible solution to labour problems due to abolition of the Indian indenture system.

1924 Australia becomes entirely self-supporting in regard to sugar, with a surplus for export.

1926 Penang Mill, Fiji, purchased by C.S.R.

Queensland Cane Growers' Council established by legislation.

1927 Proprietary Sugar Millers' Association formed in Queensland.

1929 Queensland Sugar Cane Technologists' Association established.

1930 Cottesloe refinery, Perth, Western Australia, opened by C.S.R.

Peak year scheme introduced by proclamation under the Sugar Acquisition Act of 1915. Mill peaks were thus established and terms and conditions of payment were set out for up-to-peak sugar and for sugar in excess of each mill's peak.

1932 C.S.R.'s Childers mill closed on completion of season.

1937 International Sugar Agreement signed by 21 nations, including Australia, for the establishment and maintenance of an orderly relationship between supply and demand for sugar in the world market.

1949 Sugar Research Ltd. inaugurated by Queensland sugar millers.

1951 British Commonwealth Sugar Agreement, for the regulation of sugar production and marketing within the British Commonwealth, and for the supply of sugar to the United Kingdom, is signed.

1953 Australia produces over one million tons of raw sugar in one crushing season.

1954 C.S.R. operates first Australian bulk-loading plant for raw sugar at Harwood Mill, on the Clarence River, New South Wales.

1955 Bulk raw sugar receiving and storing plants operate at Pyrmont and Yarraville refineries.

APPENDIX 5 AN APPLICATION OF CHEMICAL CONTROL TO A MANUFACTURING BUSINESS

A paper read by E. W. Knox, General Manager of C.S.R. Company, at a meeting of the Australasian Society, January 1890 (slightly abridged).

As there are still doubts in many minds about the money value of scientific aid in practical work, I have thought that some interest might be taken in a short account of a purely commercial application of chemical science to a manufacturing business—an application, I think, unique in its completeness as far as Australasia is concerned, though in Europe many better examples might easily be found, but few, if any, where the staff of experts is so large or the work done so wide in its scope.

The business I speak of is that of the company known as the Sugar Company, which is largely interested in the manufacture and refining of sugar in five of the colonies of the Australasian group. Having entered the service of this company twenty-five years ago, and having since passed through all its grades, I can speak with some authority of its transactions; but as I have not enjoyed any training in science, I will deal with the subject on which I am to address you merely from the point of view of one concerned with the results alone.

About ten years ago, we were led by the great attention then being paid to chemical research in connection with the beet-sugar industry to commence such investigations into our mode of work. We did not know clearly what we wanted, nor did the man we engaged, so the first start was not a success; but it showed us that we were on the right track, and we accordingly engaged in Scotland a refinery chemist, and a year later two beet-sugar chemists in Germany, and began the systematic check on our working. Of these gentlemen the former is now our head chemist (Mr T. U. Walton, B.Sc., F.I.C., F.C.S.) and one of the latter our inspecting chemist (Gustav Kottmann, Ph.D.), and it is to the patience and industry of these two gentlemen and to the system they introduced that much of the success we have achieved is due. The chemical staff then fast increased in numbers, but it was not till I visited Europe in 1885, and saw there to what an extent the supervision of industrial work was passing into the hands of those having chemical knowledge, that any large portion of the practical work was entrusted to members of our chemical staff. I sought, however, authority for such a change, and during the past two or three years have gradually, as chances offered, transferred to men who were trained chemists or analysts the management of a large part of our manufacturing operations.

The method adopted now is as follows:—There is a central laboratory in Sydney where the head chemist is stationed. Here five or six officers, including juniors receiving elementary training, are always at work, and to this centre all the returns from each factory are forwarded weekly. At each sugar mill and refinery (nine and three respectively) there are employed a chemist or analyst and one or more juniors or assistants—not counting

the officers who may be engaged in overlooking the manufacture—and each of these analysts is responsible for the chemical investigations to be carried out at his station. At the mills these comprise:—Analysis of the sugar cane as received, of the juice expressed, of the megass or crushed cane after the juice has been removed, of the clarified juice, of the clarified juice after it has been boiled down, of the massecuite from the pans, of the sugar and molasses, of the coal; and, in addition, a record is kept of the work done, and each week a statement is prepared which shows the quantity of cane crushed and sugar produced. The work, of course, is so arranged that the more important analyses which determine the amount of sugar lost in the various processes are frequently made, and those of smaller moment as time permits.

At the refineries the sugar is all sampled and analysed according to the various brands on being landed from the ships, and it is stowed so that it can be procured as wanted. Each day's melting is again analysed, and the weekly averages of all sugars and syrup produced. There is also a careful examination made of the bone-black used for filtering, to determine if this has been rightly re-burned, and full analyses of this, also, are made from time to time. The records of the work are prepared on different lines from those for the mills, but there is a similar check, and occasional investigations have also to be made into other points connected with the refinery work.

At the end of each quarter for the refineries, and of each crushing season at the mills, the weekly returns which have been prepared are summarized and tabulated, and careful comparisons made between the results at the various factories, improvements effected, or new methods suggested brought under the notice of the leading officers, as are also the occasional shortcomings relentlessly exposed by the figures recorded. The refinery returns are all under the charge of the head chemist, the mill returns under that of the inspecting chemist; and the whole of them are made out in such a way that the administrative heads of the different departments—who as a rule know nothing of chemistry—can grasp the main features very easily, and then at once deal with any matters which call for attention or explanation.

All the work in connection with sugar is carried out by the aid of the polariscope, and, indeed, could hardly be done without this instrument, which has been devised to make a practical application of the property that a solution of sugar has of altering the character of polarized light allowed to shine through it. The degree of change thus experienced by the rays of light is in exact proportion to the quantity of sugar present in the solution, and when measured by suitable prisms the amount of sugar thus becomes known. This apparatus is the outcome of a long series of experiments and discoveries commenced nearly seventy years ago, and it serves well to illustrate the dependence of practical work on purely scientific inquiry conducted for the acquisition of knowledge, and in this instance, I think, without thought of personal gain.

So far I have spoken altogether of the manufacturing work, but I should here state that we have now also taken the chemical staff into our counsel

in regard to the cultivation of the cane grown on our own plantations, at present about fourteen to fifteen thousand tons. In past years we have not availed ourselves to any extent of the assistance of the chemists in this department, partly because we were working virgin land, and partly because, till a short time ago, nearly the whole of our supply of cane—and still a large proportion—was grown by others, and sold to us when cut.

However, the partial exhaustion of our lands, and the necessity for applying manure, the desirability for improving the present canes and for introducing new varieties, and some little trouble with diseases in the canes, compelled us to seek the aid of our chemical staff in this branch also, and we are now carrying out an elaborate investigation into the composition of the soils of our various estates; and, under the supervision of the chemists, a vast number of trials in the special cane nurseries established by us two or three years ago, and in the fields with manure of various compositions applied in different ways, and with irrigation and many systems of planting.

From all these experiments we shall, in the course of time, derive much benefit; but though there can be little doubt that, by careful selection of cane and manure, we can increase considerably the production of sugar per acre, still we can hardly hope that there can in a short time be any improvement in the sweetness of the cane at all corresponding with that obtained in Europe in a few years in beet-roots. Sugar cane is one of those grasses which have been hitherto believed not to produce fertile seed, and as propagation is, therefore, effected by planting cuttings, no one has attempted to produce by selection of seed—as is done with the beet—that marked increase in saccharine contents which is so much desired, and any improvement in this direction, if actually effected at all, by continually planting the sweetest canes, can only be gained by slow and painful steps. Fertile seeds have, however, been lately found by scientific observers in the West Indies and in Java; and, as their success in raising plants from such seeds will be emulated by hundreds of planters all over the world, it seems possible that we may now be on the threshold of an important change in our methods of propagating cane, and that we may have grounds for hoping that in the early future we may bring about a sensible improvement in the sweetness of sugar cane.

A good deal of attention is also paid by the chemists to the saving of what are usually called waste products. These play an important part in the manufacture of sugar from the cane. The crushed cane, after the obtainable sugar has been extracted, is used for firing the boilers, and thus furnishes a very large proportion of the fuel needed for working the factory; and this, too, serves a second purpose, as the ashes from it contain a good deal of potash and other fertilizing substances, which are needed for application to the fields from which the cane has been taken. Then, again, at all our factories the water driven off the juice of the cane, while this is being boiled down, is caught and used for watering the megass before it goes to the second mill, and for other purposes; and at our New South Wales mills,

where fresh water cannot be obtained, it is fed into the boilers, which are thus both fed and fired with parts of the cane we buy. There is, however, one waste product for which yet but little use has been made; this is molasses, of which we make about 5,000 to 7,000 tons a year. Of this quantity we distil nearly half and sell a small proportion for other purposes, but the balance is put on the fields as manure or thrown away. As it contains about 40 per cent cane sugar and 10 per cent to 20 per cent glucose or grape sugar, it is a material of the greatest value in feeding stock, but, so far, we have not found it possible to make arrangements for disposing of it in any quantity.

In the refineries, also, we effect some savings from the by-products, by recovering sulphate of ammonia from the bones we distil for making the filtering charcoal, and the spent charcoal itself converted into superphosphate, the three important components of cane manure—ammonia, phosphoric acid and potash—being, to a certain extent, provided by waste material of our own business.

It could not be expected that changes in our methods such as have been here alluded to, and the general adoption of chemical control, could be carried out without some friction. Among even the strongest and most intelligent of our officers there was at first a hardly concealed scorn for the new-fangled notions and distrust of the chemists' work, but these have now entirely disappeared, and, in every direction, their reports are, as a rule, accepted without question and with confidence in their fairness and accuracy, and the help of the chemists is sought in many ways—here by a manager who wants to check waste in some branch of the manufacture; there by an agricultural overseer who wishes an analysis of the water he is using for irrigation, or advice as to the proportion of manure to apply to a field; or, again, by an engineer who asks for an analysis of the coal he uses, or of the gases from a boiler flue in order that he may know if the setting of the boilers and the arrangement of the firebars are those most conducive to the economical combustion of the coal.

Having thus briefly sketched our system, I may say a few words about the financial results; and first, as to our expenditure, would state that we are now paying to the chemical staff and to those officers charged with the control of part of the manufacturing business who possess a knowledge of chemistry, and have been chosen for those posts in consequence, some £8,000 to £9,000 a year in the shape of salaries and allowances for board, &c. There may be some doubt how we can be repaid for such expenditure, but any doubts on this point I do not, in the remotest degree, share. It would be almost impossible, even if it were necessary, for me to state exactly what is the value of the savings we have to set against such an expenditure, but among those in whose hands the general control of our business is placed, there is not a second opinion as to the money advantage of the chemical check; and when I say that saving 10 or 12 lb. of sugar for each ton of cane—say, .5 per cent of the weight of the cane—means to us £15,000 to £20,000 a year, and that an improvement in the colour of our refined sugar which will bring us a few shillings per ton more for it represents a similar sum, some

idea can be gained of the ground on which the chemical staff has to work, and of the savings they can effect; and I can add that some of the losses in our manufacturing business have, by their aid, been reduced by one-third during the past four years, and the extent of this saving can be guessed by the fact that in one year the entire losses of sugar at our mills amounted to 14,000 tons—i.e., the cane we crushed contained 14,000 tons more sugar than we were able to turn into marketable sugar.

From the sum of such loss it is easy to see that there are yet great possibilities in the manufacture of sugar from the cane, and, in the cultivation of this crop, much can still be done by manuring and thorough culture, even if the sweetness of the canes be not increased, as before suggested. We know now that on one plantation in Java the entire crop of cane has contained in one year as much as eight tons of sugar to the acre—the cane being about 12 months old—and when we bear in mind that the weight of an unusual crop of maize (80 bushels) is two tons, and that a 40-bushel crop of wheat gives a total yield of one ton of grain and two tons of straw, some idea will be gained of the effect of tropical rain and sunshine in forming sugar in the cane when circumstances are favourable and the cultivation and manuring are carefully done under skilled supervision. It will be seen, moreover, that sugar cane occupies an exceptional position among other crops in the weight of marketable produce which can be extracted from it.

And to the money benefits obtained by the chemical check we must add two more, both of considerable importance. The first is the great advantage of having, in a large service like ours, a body of men of various ages, trained in the knowledge that their work is useless unless it is carried out with patient thoroughness, accompanied by uncompromising truth-telling. No chemist, worth his salt, dreams of concealing anything wrong, or twisting his conclusions so as to hide defects in the work of himself and others, and it is surely of great value to have an example of this sort always before the younger as well as the older men. To those who fear to confess a mistake, the certainty of its exposure acts as a useful tonic, while to all—from the top to the bottom of the staff—the example is wholesome. The second is the mental refreshment and the increased interest in the work due to the constant discussion of recorded facts and opinions, and of the experiments of the chemists. Speaking for myself, I can say that I have frequently found that energy, flagging from the pressure of routine and other monotonous work, has again been roused by interesting reports of experiments or suggestions as to the changes in our methods; and, in the cases of others, the constant competition between the officers, the chances offered in the interval between the seasons for independent research, and the interchange of results certainly produce healthful and useful interest in the work.

Such is the record of our experiences, but I may, before concluding, answer two questions which are sometimes put to me: These are—"How was such a staff got together?" and "What education do you consider best for boys intended for chemical work?" To the first I would say that the officers I have mentioned, and one Englishman, one Scotchman, and one

German besides, were engaged in Europe and brought to Australia by us. The rest were engaged here and trained by us, with the exception of a few who had instruction in chemistry before entering our service. The staff now consists of—nine Scotchmen, two Germans, three Danes, one Belgian, one Swiss, two Englishmen, fourteen Australians, in all thirty-two. The Australians, who are all younger than the others, have shown that in quickness and natural ability they are not inferior, though not all possessed of the patient perseverance which is so marked a characteristic of the Scotch, Danes, and Germans; and some of them have been in a measure hindered in the acquisition of the knowledge of the work by superficial school training. And this remark brings me to the second question, about the education best calculated to benefit boys intended for chemical work. To this the reply is very simple, viz., that in my opinion no special training should be attempted. Of all the plausible fallacies put forward from time to time about education, the most foolish seems to me that of attempting to teach any boy a trade at school.

There only remains now for me to add the hope that the facts and opinions I have been permitted to bring before you today may be of some use in showing how, by the employment of trained experts, the results from manufacturing and agricultural work can be improved, and the losses which now occur may be reduced, and those products now called waste utilized, which latter may, in other industries—as in the manufacture of gas—be found of sufficient value to cause an enormous reduction in the expenses of manufacture.

APPENDIX 6 THE C.S.R. COMPANY AND ITS STAFF IN THE 1890s

Excerpts from remarks addressed to a luncheon gathering of members of the Employees' Provident Fund by the General Manager, E. W. Knox, February 1892.

I cannot do better than avail myself of this chance to say something of the position and policy of the Company, and of the ends and aims of those who have the direction of its affairs. It is now two years since I had the opportunity of addressing you, and I then spoke of the changes which had taken place in my term of service—now almost twenty-eight years. But important as these changes were, I am not sure that during the last two years there has not been an alteration in the position of the Company of much greater moment, this being the paying off by the shareholders of some seven or eight hundred thousand pounds of indebtedness to the public, thus bringing the paid-up capital to nearly one and a half millions—a sum not exceeded by, I believe, any Company in the world occupied in a similar trade. This action is a most significant one. It places the Company at once in a position almost secure from attack from any side; it relieves the shareholders from anxiety about having to pay calls on their shares, or to meet heavy payments for interest when times are bad; and it will, I believe, by giving such relief, cause the proprietors to look with even more favour than hitherto on any scheme which, while not unfairly taxing them, will tend to improve the position of their employees.

I am not without hope that the principle now adopted will be maintained until the Company is practically free from debt, and there is then no one concerned in our business but those who pay and those who receive the pay, employers and employed. And I must confess that in expressing this hope I am to a certain extent thinking of myself, for though most of us have a knowledge of the pressure of debt, and of the liberty implied in the words "freedom from debt", a man must have some experience of the constant anxiety attaching to the provision of forty to fifty thousand pounds a year for interest from a business such as ours is before he can realize to the full the relief afforded by the change to which I have referred.

Thanks to the managers of our plantations, and to the chemists and engineers, the former of whom have helped us to grow better and cheaper cane, and the latter to reduce our losses and expenses, there has been a steady diminution in the cost of our sugar, and the road has been pointed out which will lead us further in this direction, and which we must follow, for our margin of profit narrows each year, and must be maintained by improvement in our work. And to what point we have already got you will understand when I say that we must ship the sugar from our mills at about the cost of flour before we get a return on our capital invested in this branch, and flour is made with an infinitely smaller capital and labour staff per ton produced than are needed for turning out sugar.

And along with these changes there has been a steady improvement in the conditions of service. We have not brought out any wonderful scheme

such as members of Parliament talk of, which will grow figs on thistles, and abolish hard work, but we have sought quietly, and without undue sacrifice, to aid you in making provision against sickness and old age, to avoid fluctuations in work and in your employment, and in some minor matters to arrange for the work we have to do being conducted under improved sanitary conditions. Some of you will, no doubt, think that we can go yet a good deal further in the same direction, and you may be right, but you must be content with gradual progress. Violent changes cannot be made without great harm in this or any other business, and you must get what comfort you can out of the assurance that none of those who have the control of the Company's affairs have yet come to the point of believing that in almost every detail of your and our work improvement is not possible.

Altogether I think we have some justification for the assertion that the history of the past two years is one of progress, and that something has been done in this period to place our business on a basis even more firm and stable than that on which it previously rested, and all the stronger because we are not, and do not mean to be, dependent on any one's favour. We want your goodwill, of course, but not your favour; there is a wide difference between these two words.

Just as we wish our shareholders to keep their shares for themselves and their children, because the investment is a sound one, giving a steady and reasonable return; just as we want our customers to buy our sugars, because they are the best and cheapest they can get; so we want you to stay in our employ, because we give as good pay and as regular work as any other employers, and opportunities of providing for the future, and because, as far as the present is concerned, we mean to try to save you from the fall in wages and salaries—I do not mean nominal wages, but actual earnings.

I think you all ought to know how the Provident Fund originated, and what grounds we have for faith in its future and stability. It was in 1889 that I first began to try and puzzle out some scheme which could take the place of our first confessedly imperfect Provident Fund, and thus provide a means of living for men growing old in the service or disabled by sickness or accident, and with this object in view I read such books as I could obtain bearing on the matter; these were all, however, about sharing of profits, and I was compelled to put them aside, not because such division of profit is an unwise proceeding from the point of view of those who might wish to share the gains without any responsibility for the losses incidental to all trade, but because employees, as a class, have not yet realized that the profits made are the earnings of the man who finds the money, as the weekly or monthly payments to them are the remuneration for their work, and that sharing the profits without likewise bearing part of the losses is in effect accepting a charitable dole.

Now I was sure that the last thing you wanted was to sacrifice your independence, or to accept a dole of any sort, and I had therefore to put on one side all the schemes described with much eloquence in the books of which I have spoken, feeling sure that when you wanted part of the

profits that were the due earnings of the shareholders' capital you would get this by buying the shares of the Company with your savings, and that till then we had better go on the old basis of paying you fairly and duly for the services you rendered to us, and retaining the balance for the proprietors of the business.

I did not, however, abandon my search for the fund, and one day was rewarded by finding in a little book called *The Management of an English Railway*, a short account of the Provident Fund of the London and North-Western Railway, which seemed to me pretty well what I wanted. Details not given in the book were supplied to me by Mr Eddy, who took an interest in what I was doing as he was at the time endeavouring to start such a fund for the Railway Service—of which, by the way, political jealousy has robbed the Railway men—and I then took into my counsels Mr Walton, and we set to work to draft the leading rules. From the first, however, I decided to make three or four important departures from the English scheme—viz., to put the whole of the employees on the same footing as to subscription, whereas the London and North-Western fund was for the salaried staff only; to allow of the investment of part of the funds in shares of the Company; and to make the rules relating to the return of subscriptions to men leaving the service as liberal as was possible and just. In other respects the lines of the other Society have been followed, and I can only hope that we shall in the course of time be able to show as satisfactory results.

There are no doubt some here who do not share my views as to excluding charity from a business of this sort, as it is now excluded, for I sought and obtained the Company's support on the ground that there was good value to show for the sum they give annually to the fund; but I feel sure that the great majority think as I do, that a pension however large is dearly purchased by a sacrifice of any portion of the independence of spirit which you should all possess, and whether you agree with me or not I am sure I am right in this—I have doubts about being right in other matters much more often than other people suppose—and I certainly will stick to the lines I have laid down and to the principles that have guided me in this matter.

APPENDIX 7 CHAIRMEN, DIRECTORS AND GENERAL MANAGERS OF C.S.R. COMPANY; AND MEMBERS OF THE NEW ZEALAND BOARD OF ADVICE TO THE COMPANY

Chairmen of Directors:

Edward Knox	1855-1857	1861-1877	1880-1883	1885-1891 1893-1901
Daniel Cooper	1857-1861			
Walter Lamb	1878-1880	1883-1885		
Thomas Buckland	1883	1891-1893		
Henry Edward Kater	1901-1920			
Edward William Knox	1920-1933			
Edward Ritchie Knox	1933-			

Directors:

Edward Knox	1855-1877	1880-1883	1885-1891	1893-1901
William Fanning	1855-1858			
Walter Lamb	1855-1856	1857-1862	1864-1882	1883-1892
William Benjamin Walker	1855	1862-1866		
Edwin Tooth	1855			
Robert Tooth	1855-1863			
Daniel Cooper	1855-1861			
Alfred Spry	1856-1857			
Frederick Fanning	1858-1871			
Thomas Buckland	1861-1886	1887-1896		
Frederick Tooth	1863-1864			
Charles Parbury	1866-1870			
Alfred Stanger Leathes	1870-1880	1882-1883		
Frederick Close Griffiths	1871-1881	1884-1907		
Joseph Grafton Ross	1878-1880			
John Brown Watt	1880-1884	1886-1888		
James Milson	1881-1887			
Edward William Knox	1883-1885	1891-1893	1901-1902	1920-1933
Robert Lucas Tooth	1888-1889			
Walter Cumming Watt	1889-1920			
Henry Edward Kater	1892-1924			
Henry Normand MacLaurin ...	1896-1906	1906-1914		

Charles Kinnaird Mackellar	1902-1904	1905-1912
	1913-1923	
Richard Binnie	1904-1905	1906
	1907-1913	1914-1917
Astley John Onslow Thompson ...	1912-1914	1914-1915
James William Macarthur Onslow ...	1915-1924	1925-1928
	1929-1933	1933-1936
Robert Lionel Faithfull	1917-1930	
Edward Ritchie Knox	1923-	
Owen Esmond Friend	1924-1926	
Norman William Kater	1924-1925	1926-1929
	1930-1935	1935-1938
	1938-1949	
Philip Henry Macarthur Goldfinch ...	1928-1929	1929-1943
Robert Winton Gillespie	1929-1940	
Edward Wilfred Fairfax	1933-1949	
David Wilson	1933	1935
	1936-1953	
Handel Norman Pope	1938	1940-1947
John Gordon Crowther	1947-	
Christian Waldemar Rothe	1949-1951	
John Wallace Dunlop	1949-	
Gregory Blaxland Kater	1949-	
William John Victor Windeyer ...	1953-	
Roy William Harman	1955-	

General Managers:

Joseph Grafton Ross (Manager) ...	1855-1870
Joseph Grafton Ross (General Manager)	1870-1880
Edward William Knox	1880-1920
Waldemar H. Rothe	1920-1923
Harry V. Dixon	1923-1928
Philip H. M. Goldfinch	1928-1943
Christian W. Rothe	1943-1951
Roy W. Harman	1951-

Members of the New Zealand Board of Advice:

Sir Frederick Whitaker	1888-1891
D. L. Murdoch	1888-1911
James Williamson	1888
Thomas Buddle	1892-1918
H. B. Morton	1911-1929
Sir Henry Horton	1918-1939
	1940-1943
E. T. Horton	1920, 1926, 1929
J. Newell	1930-1942
W. R. Wilson	1933, 1939-1940
	1943-1947
R. P. Towle	1942-
R. D. Horton	1947-

APPENDIX 8 BANKERS, AUDITORS, SOLICITORS, AGENTS (other than customers), BROKERS AND CORRESPONDENTS OF C.S.R. AND SUBSIDIARIES 1955

Bankers

The Bank of New South Wales	
The Commercial Banking Coy. of Sydney Ltd.	
The Bank of Adelaide	Adelaide
The Bank of New Zealand	N.Z. and Fiji
The English, Scottish & Australian Bank Ltd.	Nth Strathfield and Brunswick

Auditors

Yarwood, Vane & Co.	Sydney
Kent, Brierley & Fisher	,,
J. H. Broinowski & Storey	,,
George A. Blackett & Lewis	,,
Merry & Merry	Perth

Solicitors

Minter, Simpson & Co.	Sydney
Malleson, Stewart & Co.	Melbourne
Blake & Rigall	,,
Finlayson, Phillips, Astley & Hayward	Adelaide
Flower & Hart	Brisbane
Stone, James & Co.	Perth
Buddle, Richmond & Co.	Auckland
William Scott & Co.	Suva

Brokers and Correspondents

C. Czarnikow Ltd.	London
Czarnikow (Canada) Ltd.	Montreal
Elder, Smith & Co. Ltd.	Sydney and London

Agents

Parbury, Henty & Co. Pty. Ltd.	London
The Adelaide S.S. Co. Ltd.	Sydney, Brisbane, etc.
Hoare, Miller & Co. Ltd.	Calcutta
R. W. Cameron & Co. Inc.	New York
W. R. Carpenter & Co. Ltd.	Suva
Calcutta Co. Pty. Ltd.	Sydney
Jack & Newell Pty. Ltd.	Cairns
Burns, Philp & Co. Ltd.	Townsville
Dalgety & Co. Ltd.	,,
Buchanan Bros.	Bowen
James Croker & Sons	Mackay
R. R. Dunn & Co.	Maryborough

Agents

Watkin & Wallis	Auckland
Minerals Fibres Ltd.	London
Carters (Merchants), Ltd.	,,
Spedding Ltd.	Auckland
Fletcher Sales & Services Ltd.	,,
Honeywill & Stein Ltd.	London
The Distillers Company (Biochemicals) Ltd.	,,
H. H. Buckley Ltd.	Auckland
J. Walter Thompson (Aust.) Pty. Ltd.	Sydney
Dormer-Beck Advertising Ltd.	Auckland

APPENDIX 9 INQUIRIES INTO AND REPORTS UPON THE AUSTRALIAN SUGAR INDUSTRY

Since 1871, when a Select Committee reported to the New South Wales Parliament on Thomas Scott's sugar cane cultivation, many Royal Commissions and Committees of Inquiry have investigated and reported upon the Australian Sugar Industry.

The most important of the reports are:

REPORT OF THE ROYAL COMMISSION ON THE SUGAR INDUSTRY, *1889* (*Queensland*) *Chairman—Mr W. H. Groom, M.L.A.*

REPORT OF THE ROYAL COMMISSION ON CUSTOMS AND EXCISE TARIFFS, *1905* (*Commonwealth*)

REPORT OF THE ROYAL COMMISSION ON THE SUGAR INDUSTRY, *1912* (*Commonwealth*) *Chairman—Sir John Gordon; and later Professor W. J. Brown*

REPORT OF THE ROYAL COMMISSION ON THE SUGAR INDUSTRY, *1920* (*Commonwealth*) *Chairman—Mr A. B. Piddington, K.C.*

REPORT OF THE ROYAL COMMISSION ON LOCATIONS FOR SUGAR MILLS, *1922* (*Queensland*) *Chairman—Mr W. Harris, P.M.*

REPORTS OF THE SUGAR INQUIRY COMMITTEE, *1931* (*Commonwealth*) *Chairman—the Hon. John Gunn*

REPORT OF THE ROYAL COMMISSION ON SUGAR PEAKS AND COGNATE MATTERS, *1939* (*Queensland*) *Chairman—the Hon. William F. Webb*

REPORT OF THE ROYAL COMMISSION ON SOLDIER SETTLEMENT ON SUGAR LANDS, *1946* (*Queensland*) *Chairman—Mr J. S. Hutcheon, K.C.*

REPORT OF THE ROYAL COMMISSION APPOINTED TO PREPARE AN ORDERLY PLAN FOR THE DEVELOPMENT OF THE SUGAR INDUSTRY, *1950* (*Queensland*) *Chairman—the Hon. Alan J. Mansfield*

REPORT ON THE AUSTRALIAN SUGAR INDUSTRY BY THE SUGAR INQUIRY COMMITTEE, *1952* (*Commonwealth*) *Chairman—Mr M. E. McCarthy*

The Royal Commission of 1889

Appointed to inquire into the "present languishing condition of the industry". Surpluses of subsidized European beet sugar had depressed world sugar markets. The boom of the early 1880s had been followed by slump. In 1889 prices were half of what they had been in 1883. A disastrous drought in 1888 reduced the Australian crop, and the effects of the Pacific Island Labourers Act of 1885 were being felt.

The Commission was asked, among other things, to report on the probable effects of withdrawing the remaining coloured labour. It found that cultivation of cane with white labour in the areas north of Townsville was impracticable and reported: "If all coloured labour is withdrawn, extinction of the industry must speedily follow."

The depression spelt the end of small mills and large areas of semi-cultivated land. The Commission realized the waste involved in this system, and advocated that cane should be grown on smaller farms. Instead of a mill on each plantation, it recognized the advantages of central mills to which the surrounding farmers could send their cane.

In 1892 the provisions of the Pacific Island Labourers Act prohibiting the further entry of Kanakas were repealed by the Queensland Government. In 1893 the Sugar Works Guarantee Act was passed, and under this the system of Government-sponsored co-operative central mills expanded rapidly.

The Reports of Dr Walter Maxwell, 1899-1910

Dr Walter Maxwell was Director of the Hawaiian Sugar Producers' Association Experiment Station when he was invited in 1899 to report on the Queensland sugar industry. He was critical of the agricultural practices being followed and suggested setting up an experiment station to help growers. This was done, and he was appointed first Director of the Queensland Bureau of Sugar Experiment Stations when it was established in 1901.

Shortly after Federation, he reported to the Prime Minister on the coloured labour question and concluded that "the Pacific Islander is a relatively declining factor in sugar production in Australia". In 1905 he reported to the Minister for Trade and Customs on the excise and rebate system, and recommended that it be extended for seven years.

Before his departure for the United States in 1910 he tendered another report to the Minister for Trade and Customs. This was accepted as evidence by the Royal Commission of 1912 and, indeed, the Chairman regarded it as "the starting point of the Commission".

During at least part of his time in Australia, Dr Maxwell's relations with the industry were somewhat strained. His last report was inaccurate in parts, critical of the industry, and advocated expansion of beet sugar production in Victoria.

The 1912 Royal Commission

Appointed in October 1911, the Commission had the widest possible terms of reference, including costs, profits, wages, prices and legislation affecting the industry.

The Chairman, Sir John Gordon, was a South Australian judge and a noted constitutionalist. Sir John became ill during the inquiry and was replaced by Professor W. J. Brown, a barrister, teacher of law and later author of *The Prevention and Control of Monopolies*. The other commissioners were the Secretary of the Australian Labour Federation, a business man and a barrister from Sydney and Mr (later Senator) T. W. Crawford. He was the only one with first-hand knowledge of the industry, a cane grower, director of a co-operative mill, and president of the Australian Sugar Producers' Association. He submitted a Minority Report.

From the outset it was evident that C.S.R. was regarded as "the villain of the piece". An attempt was made to conduct a most exhaustive inquiry into the whole of the company's affairs, far beyond the terms of reference of the Commission, and a difference arose between the Commission and the company as to information to be supplied. Some questions relating to C.S.R. business in Fiji and New Zealand, and to the financial position of C.S.R. as a whole, were not answered. The General Manager offered to supply the information in private, provided it were not published; he also invited the Chairman to inspect the books of the company in private. These offers were refused, and the Commission referred the matter to the Attorney-General. Proceedings were instituted against the directors, which eventually resulted in a High Court injunction in favour of C.S.R. and restraining the Commission from asking certain questions. The Commonwealth's appeal to the Privy Council failed. After the granting of the High Court injunction the general manager appeared before the Commission and volunteered lengthy evidence including the costs of refining and the profit from refining.

The Commission considered that the growers were for national purposes the most important section of the industry, and took the greatest risks, and that their position should be improved. It recommended principles of cane payment resembling those in the Cane Prices legislation later passed by the Queensland Government.

Proposals put to the Commission included the establishment of a public refinery and the nationalization of the existing refineries. The Commission rejected these because it considered that efficiency would not be increased by competition, and a public refinery would be wasteful duplication. Basic to all these reasons was recognition of the high efficiency of the refining business in Australia. The report states:

> *We have frequently had occasion to criticize the Colonial Sugar Refining Company from various points of view, but we do not hesitate to express our admiration of the economic efficiency which characterizes every branch of its business which has come under our notice.*

The historical significance of this Commission lies in the emphasis it placed on the need to settle and develop the exposed tropical coast of north-east Australia. The "White Australia" policy was a live political issue in 1912 and the wisdom of protecting the sugar industry to implement it was doubted by many people. The Commission was overwhelmingly in favour of the ideas that had prevailed at Federation—that the tropical coast ought to be settled with a white population and that assistance to this end was necessary. This settlement and development was recognized as a national responsibility. The report states:

> *The supreme justification for the protection of the sugar industry is the part that the industry has contributed, and will, as we hope, continue to contribute to the problems of the settlement and defence of the northern portion of the Australian continent. The recognition of the nature of this supreme justification is the first condition of a sound public policy in relation to the sugar industry. Relative to it all other issues are of minor importance.*

The "Piddington" Royal Commission of 1920

Under the "War Precautions Act" the Commonwealth Government was fixing the price of raw and refined sugar, but this Act and the Sugar Agreement were about to expire. The Commission was appointed in March 1919 to recommend on future Commonwealth control and also on an increase in price sought by the industry. Unfavourable seasons and rising costs of production affected the returns to the industry, and the low price for sugar in Australia compared with the high world market price added to the industry's dissatisfaction.

The Commission considered that Federal control was desirable as it was the only way to secure coherence of authority over an industry subject to diverse governmental regulation. It was proposed that a Sugar Control of three Commissioners be set up with complete powers over—

industrial arbitration;
efficiency in cultivation;
cane prices;
conditions of cane delivery;
engineering and chemical efficiency in mills;
price of raw sugar;
development of new mills and cane areas;
research.

Under the proposals mills and millers would be licensed. The Control would be financed by adding one per cent to the price of refined sugar.

The Commission recommended an increase from £21 to £22 per ton in the price of raw sugar.

However, the recommendations in this report were not acted upon by the Federal Government. A further agreement for a period of three years was announced by the Prime Minister, Mr W. M. Hughes, and the price of

raw sugar increased to £30 6s. 8d. per ton to rehabilitate the industry, particularly the mills, and to encourage expansion of production.

This was the last Agreement under Federal control. When it expired in 1923 the Commonwealth handed over control of the industry to the Queensland Government.

The 1922 Royal Commission on Locations for Sugar Mills

This is of interest mainly because it resulted in the erection of Tully Mill. The site for the mill was selected after an investigation of possible locations from Cooktown to Buderim.

The 1931 "Gunn" Inquiry

Since the Royal Commission of 1920 conditions had changed completely. Instead of prosperity and high world sugar prices there was depression, with falling prices and unemployment. The world sugar market was oversupplied, and raw sugar from Peru was being sold to British refiners at £4 15*s.* 0*d.* sterling per ton c.i.f.

In Australia, from 1929 there had been a well organized campaign to lift the embargo or, alternatively, reduce the price under the Agreement, which was due to expire in 1931. It was claimed that the embargo was costing the Australian consumers £7 million a year, this estimate being based on the bare difference in price between Australian sugar and the cheap, black-grown, "dumped" product. (Many calculations of this nature failed to take account of such items as sea freight, insurance, handling and storage costs, etc.)

The Queensland Government and the industry strongly defended their position, pointing out the efficiency of the industry and the value to Australia of the sugar settlements on the north-east coast. The embargo became an election issue in 1929 and the incoming Labour Prime Minister said in his policy speech:

> *The Federal Labour Party stands for the continuance of the existing embargo on the importation of sugar.*

Agitation continued, however, and the Government was forced to refer the renewal of the Sugar Agreement to a Committee of Inquiry. The Chairman, the Hon. John Gunn, was then Commonwealth Director of Development. Other members represented the Commonwealth, the industry itself, sugar employees, housewives, fruit growers and manufacturers using sugar. The C.S.R. Co. was not represented on the Committee.

It was obvious that the Committee, with such opposing interests, would be divided at least on the question of price. Although unanimity was reached on some points, a majority and a minority report were also submitted.

All members agreed that the domestic sugar industry must be preserved, and that it was efficient. The minority stated that export sugar (for which

a lower price was then obtained) ought to be curtailed and the home consumption price lowered immediately. The majority submitted that production was high but thought it could not be reduced abruptly without disruption. They could not recommend any general price reduction, but recognized that the fruit industry was in serious straits and suggested that the financial assistance to it rendered by the sugar industry should be increased. Both majority and minority were complimentary to C.S.R.

The Prime Minister, after considering the reports, said he was not disposed to reduce the price of sugar. If production were curtailed it would add to unemployment in Australia and reduce the urgently needed London funds.

The Government decided to renew the Agreement, for five years, on the following terms:

1. Existing selling prices of sugar to be continued for the first three years.
2. The fruit industry assistance plan recommended by the majority report to operate for the first three years.
3. Selling prices and fruit industry assistance to be reviewed after three years.
4. Every effort to be made to keep the production of sugar within the present limits and the assignment of sugar lands and the peak year system to be rigidly administered to this end.
5. The price of raw sugar to the miller to be subject to a maximum of £22 per ton and any surplus arising from the continuance of the present refined sugar prices to be paid to a trust account under the joint control of the Commonwealth and Queensland Governments to be held against the possibility of financing a future reduction in the price of sugar to consumers.
6. The maximum return per ton was to be increased if the production fell below 500,000 tons per annum.

The Agreement along these lines was in due course signed. But conditions in Australia still deteriorated and the campaign against the sugar industry continued.

At a Loan Council meeting in January, 1932 the Prime Minister said the sugar industry could not escape the general retrenchment. In October the 1931 Agreement was repealed. Under the new Agreement the price of refined sugar was reduced, becoming 4*d* instead of 4½*d* per lb. retail. The assistance to the fruit industry was also reduced somewhat, and provisions for fixing the raw sugar price were removed.

The 1939 Royal Commission on Sugar Peaks and Cognate Matters

Despite the Peak Year Scheme adopted in 1929, production continued to expand and by 1938 was about 165,000 tons more than the peaks.

Since 1929 the amount of sugar used in Australia had increased. Also

under the International Sugar Agreement signed in 1937 Australia had gained an export quota of 400,000 tons, and it was very desirable that this quota be filled consistently. There thus appeared to be an assured market for a greater quantity than the 1929 Queensland peaks plus the New South Wales allotment, and the Queensland Premier suggested that the peaks might be increased by 100,000 tons. A Royal Commission was appointed in 1939 to investigate the matter. The members of the Commission were a Supreme Court Judge, and representatives from the Sugar Board, Central Sugar Cane Prices Board, and the Sugar Associations.

Three separate "views" were presented by the Commissioners in their report. The majority view was that, to avoid disruption, peaks be increased to 737,000 tons on the general basis of actual production, and that production beyond this quantity be paid for at the penal and prohibitive price of 10/- per ton only.

There were other recommendations including the establishment of "farm peaks", or a definite quantity of cane from each assignment, the total farm peaks in each mill area to produce the mill's peak of sugar.

New peaks, in accordance with the majority view, were declared in the 1939 season's proclamation. The principle of farm peaks was also adopted. However, the outbreak of war soon altered the situation radically. Sugar was in great demand, and the British Ministry of Food contracted to purchase all sugar not required in Australia.

The 1946 Royal Commission on Soldier Settlement on Sugar Lands

The Commission found that it was "practical and expedient" to settle ex-servicemen in the Queensland sugar industry, and that this should be done within the areas of existing mills rather than by building new ones.

It recommended priority for ex-servicemen in the purchase of sugar farms; the assignment of new lands to fill the peak of any mill which consistently fell short in its production; the assignment of virgin lands adjacent to existing mill areas; and increased assignments on existing farms of ex-servicemen.

The Queensland Government passed the War Service (Sugar Industry) Land Settlement Act (1946), which followed the main recommendations of the Report.

The "Orderly Plan" Royal Commission of 1950

Growing home consumption demand and an export quota of 600,000 tons gained at the 1949 Commonwealth sugar discussions gave promise of increased markets for the Australian sugar industry. The 1948 and 1949 seasons had produced good crops and confidence in the industry was high. The Central Cane Prices Board had already made provisional increases in peaks up to 1953, but these did not seem enough for expected development after that. The Queensland Government then appointed a Royal Commission "to prepare an orderly plan for the development of the sugar industry during the next 25 years".

The report was published in 1951. It dealt with the problem of markets in two steps, to 1962, and to 1975, and suggested how the extra sugar could best be produced.

The Commission considered various sites proposed for new mills, but recommended that for economic reasons no new mill be built in the first period, and probably not in the second. Extra production should be obtained by new or increased assignments in present or nearby areas, and expansion of existing mills; further, most of the expansion should take place in the districts north of Proserpine.

The 1952 Committee of Inquiry

Following the recommendations of the 1950 Commission, the industry was committed to heavy capital expenditure when, in 1951, the position changed abruptly. A bad season caused a drastic fall in output, and this, together with the fact that home consumption sales rose excessively that year, meant a loss of profitable export sugar. Costs at all stages of production continued to rise, along with all other costs in Australia. Early in 1952 the industry was forced to seek an increased price for its home consumption sugar.

The Commonwealth Government, when granting an interim increase in the retail price of sugar in March, 1952, also set up a Sugar Inquiry Committee. Its Chairman, Mr M. E. McCarthy, was then Commonwealth Prices Consultant, and other members came from the Department of Trade and Customs, the Treasury, the Queensland Department of Agriculture and Stock and the Queensland Sugar Board.

The terms of reference covered: the production, manufacture and distribution of sugar in Australia; costs, profits and prices of raw sugar; the effect of export sales on raw sugar prices; the effect of sugar prices on manufacturing industries using sugar and on primary industries whose products are processed with sugar; and the possibility of providing in the agreement for sugar prices to be varied in accordance with costs.

The Committee visited the sugar districts and inspected farms and mills, and also refineries in the capital cities. It heard evidence in the sugar districts and in Brisbane, Sydney and Melbourne. Representatives of the sugar industry submitted very detailed evidence regarding the general organization of the industry and particulars of cane growing, raw sugar production, and refining. Special points, including Australia's obligation to export up to her quota under the Commonwealth Sugar Agreement, the payment of export rebates, and the industry's proposals for price adjustments, were also dealt with. Users of sugar such as manufacturers of jam, canned fruits and condensed milk, grocers' representatives, and the Housewives' Association, gave evidence concerning their particular interests.

The Committee's Report gave a general review of the industry, and dealt in detail with the particular points of the terms of reference. The

Committee reached a long series of conclusions about costs and funds employed; the efficiency of the industry; the contribution of the sugar industry to the national economy and the effect on consumers of a price rise; rebates on sugar content of manufactured goods exported and methods of paying them; and other matters. A fundamental fact was the recognition of the importance of the sugar industry in populating northern Queensland, and the desirability, from the social point of view, of a primary industry supporting small, owner-operated farms.

As to the marketing and refining functions of the C.S.R., the Committee reported that "because of the important position occupied by the C.S.R. in the sugar industry the Committee paid particular attention to its functions and operations". After discussing the company's functions they said: "The Committee is satisfied of the substantial effectiveness of this arrangement (i.e., the method of negotiating and fixing the charges made by the C.S.R.) in the interests of both consumers and producers"; and "the company's efficiency was not questioned by any witness". The Committee also commented: "On the subject of the company's profits from refining and other operations on behalf of the Sugar Board it can be stated that if it had forfeited the whole of the profits from these sources over the last three years and the reduction had been passed on to consumers the difference in price would have been less than $\frac{1}{8}d$ per lb."

The Committee also made a number of recommendations, the most immediately important of which was an increase in the price of sugar. Separate recommendations for an increase of $\frac{1}{2}d$, $\frac{3}{4}d$ and $1d$ per lb. were made by various members of the Committee. Other recommendations were: that the fruit industry rebate of £2 4*s* 0*d* per ton remain unaltered; that the provisions in the Sugar Agreement Act regarding the Fruit Industry Sugar Concession Committee remain unaltered; that a new method of calculating export rebates be introduced to allow exporters of manufactured goods the greatest possible rebate, and that such rebate be paid on the sugar content of specified goods only; that a Tribunal be appointed, comprising a chairman appointed jointly by the Commonwealth and Queensland Governments, a nominee of the Commonwealth Government and a nominee of the Queensland Government, to "examine and report to the Minister for Trade and Customs, when required by him, upon the cost and associated elements in the sugar industry".

The Commonwealth Government decided to increase the price of refined sugar by $1d$, to $9d$ per lb., as from 13 October 1952. The other recommendations of the Committee were accepted, except that advocating a Tribunal.

APPENDIX 10 A BRIEF BIBLIOGRAPHY OF SOURCES CONSULTED FOR THE HISTORICAL CHAPTER OF THIS BOOK

UNPUBLISHED MATERIAL

Business records of the Australasian Sugar Company 1842-1854 and the Colonial Sugar Refining Co. 1855-1887; the New Zealand Sugar Company Ltd. 1883-1887; the Victoria Sugar Company 1857-1887; the C.S.R. Co. Ltd. 1887 to date. The most valuable records among these are the minute books for all the companies except the Victoria Sugar Company from 1842 onwards; the Directors' half yearly reports of C.S.R. from 1855 onwards (printed for the years 1855 and 1887 to date and in manuscript for the intervening years); the letter books for C.S.R.'s sugar mills from 1879 onwards and the Mill Reports, showing the progress made during each crushing season from 1870 onwards. Of great interest are the letter books, reports and circulars of the company's first chemists, T. U. Walton and Dr G. Kottmann. Among the legal documents still surviving are the printed copies of the deeds of settlement of the Australasian Sugar Company 1842; the Colonial Sugar Refining Company 1855, 1881 and 1906; and the Memorandum and Articles of Association of the New Zealand Sugar Company Limited 1884.

Knox Mss.—various letters and papers of Edward and E. W. Knox, some private and some relating to business matters. Most important among these documents are the various reports compiled by E. W. Knox on his trips to the northern rivers of New South Wales, to Fiji and to France and Germany (C.S.R. Library and uncatalogued Set 98, Mitchell Library).

Various Mss.—relating to the development of the Australian sugar industry (Mitchell Library—catalogue of manuscripts under heading "Sugar").

OFFICIAL SOURCES

Royal Commissions and Inquiries—see Appendix 9 which lists some of those consulted.

Official Statistical Reports—many official returns have been consulted. Data from some of them are incorporated in Appendix 11.

Parliamentary Proceedings—HANSARDS of the N.S.W., Queensland and Commonwealth Parliaments have been consulted.

OTHER SOURCES *Selected items only*

Adamson, S.: THE QUEENSLAND SUGAR INDUSTRY. *Unpublished thesis, Brisbane, 1953.*

Anon: THE SCOT WE KNOW: T. U. WALTON. *The Scottish Australasian. Oct. 1913.*

Bondfield, W. G.: The Rise of the Sugar Growing Industry in the Richmond River District.
Richmond River Hist. Soc. Jnl. Vol. 2, 1938, pp. 20-29.

Borrie, W. D.: Italians and Germans in Australia.
Melbourne, 1954.

Brigden, J. B.: The Story of Sugar.
Queensland Bureau of Economics & Statistics, 1932.

Coulter, J. W.: Fiji; little India of the Pacific.
U. of Chicago Press, 1943.

Curlewis, F. C. P.: An Aspect of the Australian Sugar Industry: The Co-ordination of State Control & Internal Organisation.
Paper read to Qld. Bch. of Econ. Soc. of Aust. & N.Z., 1933.

Deerr, N.: The History of Sugar.
2 vols., London, 1949-50.

Derrick, R. A.: A History of Fiji.
Vol. 1, Suva, 1946.

Derrick, R. A.: The Fiji Islands.
Suva, 1951.

Easterby, H. T.: The Queensland Sugar Industry.
Brisbane, undated (c. 1930).

Geerligs, H. C. P.: The World's Cane Sugar Industry; Past and Present.
Altrincham, 1912.

Jervis, J.: Thomas Alison Scott and the Genesis of the Sugar Industry.
Roy. Aust. Hist. Soc. Jour., Vol. 26, pp. 387-396, 1940.

Jose, A. W. & others: Australian Encyclopaedia.
Article "Knox, Edward", 3rd Ed., 1927.

King, N. J.: The Australian Sugar Industry: Some Facts & Figures.
Q'ld. Bur. Sug. Exp. Sta. c. 1954.

Knox, E. W.: An Application of Chemical Control to a Manufacturing Business.
Paper read to Australasian Assoc., 1890.

Lyne, C.: The Industries of New South Wales.
Sydney, 1882.

Lyng, J.: The Scandinavians in Australia, New Zealand and the Western Pacific.
Melbourne, 1939.

Mackay, A.: The Sugar Cane in Australia.
2nd Ed., Sydney, 1883.

Masefield, G. B.: A Short History of Agriculture in the British Colonies.
Oxford, 1950.

Maxwell, W.: Report upon an Investigation into the Condition of the Sugar Industry in Queensland.
Brisbane, 1900.

O'Brien, C. H.: The History of the Australian Sugar Industry.
Aus. Sug. Jour., 1951-1953.

Roth, H. Ling: A Report on the Sugar Industry in Queensland.
Brisbane, 1880.

Shann, E.: An Economic History of Australia.
Cambridge, 1938.

Shephard, C. Y.: The Sugar Industry of Fiji.
HMSO, London, 1945.

Stanner, W. E. H.: The South Seas in Transition.
Sydney, 1953.

Stevens, E. V.: Blackbirding: a Brief History of the South Sea Islands Labour Traffic & the Vessels Engaged in it.
Q'ld. Hist. Soc. Jour., 1950.

Strong, L. A. G.: The Story of Sugar.
London, 1954.

Wilkinson, H. L.: The Trust Movement in Australia.
Melbourne, 1914.

A Century of Banking: The Commercial Banking Co. of Sydney Ltd; 1834-1934.
Sydney, 1934.

Fifty Years of Scientific Progress.
Queensland Bureau of Sugar Experiment Stations, Brisbane, 1950.

The Colony of Fiji: 1874-1929.
Offic. Publ., Suva, 1929.

Victoria Mill.
C.S.R. Co. Ltd., Sydney, 1953 (privately printed).

NEWSPAPERS & PERIODICALS

Australian Sugar Journal Vol. 1, 1909—to date.
Australian Town & Country Journal, 1897.
Clarence & Richmond Examiner, 1868-9.
New Zealand Herald, 1880-4.
Sydney Morning Herald, 1842—to date.
The Australian, 1840-1844 passim.
The Sugar Cane, Vol. 1—30, 1869-1898, afterwards the International Sugar Journal, Vol. 1, 1899—to date.

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APPENDIX II RAW SUGAR PRODUCTION BY C.S.R. 1870-1954

Long tons tel quel to 1899 thereafter tons 94 net titre

Season	Total Aust. (see note)	C.S.R. Mills			
		Queensland	N.S.W.	Fiji	Total C.S.R.
1864	2	—	—	—	—
1865	3	—	—	—	—
1866	8	—	—	—	—
1867	228	—	—	—	—
1868	2,077	—	—	—	—
1869	3,081	—	—	—	—
1870	3,532	—	1,458	—	1,458
1871	5,554	—	1,031	—	1,031
1872	7,976	—	1,193	—	1,193
1873	8,707	—	1,841	—	1,841
1874	18,963	—	4,877	—	4,877
1875	11,168	—	3,618	—	3,618
1876	12,912	—	3,991	—	3,991
1877	19,780	—	5,489	—	5,489
1878	21,685	—	4,974	—	4,974
1879	26,306	—	5,352	—	5,352
1880	22,864	—	5,278	—	5,278
1881	27,003	—	5,636	—	5,636
1882	29,202	—	8,804	2,506	11,310
1883	50,148	1,500	7,825	4,325	13,650
1884	43,510	1,350	5,885	5,331	12,566
1885	77,689	8,460	11,610	7,069	27,139
1886	70,609	8,125	9,565	11,090	28,780
1887	80,460	7,857	17,272	7,895	33,024
1888	45,301	6,140	8,109	9,957	24,206
1889	63,427	10,631	11,615	8,945	31,191
1890	96,516	14,445	19,224	11,859	45,528
1891	n.a.	10,562	13,159	11,994	35,715
1892	85,657	8,926	22,184	12,234	43,344
1893	100,076	11,779	18,715	11,641	42,135
1894	114,350	17,828	15,905	19,611	53,344
1895	108,468	19,887	14,378	18,644	52,909
1896	129,331	27,421	21,073	22,041	70,535

APPENDIX II—*continued*

Season	Total Aust. (see note)	C.S.R. Mills			
		Queensland	N.S.W.	Fiji	Total C.S.R.
1897	125,569	30,907	21,376	27,046	79,329
1898	192,844	44,219	22,930	29,594	96,743
1899	138,639	38,260	12,854	26,714	77,828
1900	107,034	29,557	17,049	25,574	72,180
1901	132,964	40,826	17,131	25,999	83,956
1902	92,744	33,734	19,524	28,588	81,846
1903	107,776	35,548	19,934	44,104	99,586
1904	158,763	46,970	19,741	52,632	119,343
1905	173,456	51,036	19,632	40,690	111,358
1906	209,218	54,476	23,137	39,936	117,549
1907	218,506	53,031	29,117	62,049	144,197
1908	166,594	46,759	15,175	61,199	123,133
1909	149,925	43,335	14,589	64,542	122,466
1910	231,619	59,898	18,957	62,776	141,631
1911	191,157	52,807	16,663	67,241	136,711
1912	130,035	40,263	16,975	65,400	122,638
1913	265,574	68,408	22,737	91,840	182,985
1914	246,527	73,632	20,680	93,764	188,076
1915	159,080	45,109	18,584	90,313	154,006
1916	193,433	60,865	16,460	114,397	191,722
1917	328,267	83,060	20,553	88,945	192,558
1918	202,441	50,725	12,463	63,323	126,511
1919	173,239	54,419	11,103	60,166	125,688
1920	182,763	51,331	15,362	83,649	150,342
1921	300,191	75,928	17,993	71,047	164,968
1922	306,340	74,912	18,555	44,537	138,004
1923	285,816	79,404	16,641	36,967	133,012
1924	436,815	102,266	27,629	66,201	196,096
1925	518,704	119,129	33,119	99,736	251,984
1926	416,377	98,084	27,105	69,761	194,950
1927	510,140	106,268	24,395	97,367	228,030
1928	538,047	124,785	17,427	95,430	237,642
1929	538,702	121,367	20,186	88,849	230,402
1930	536,304	103,479	19,521	93,381	216,381
1931	604,564	131,109	23,288	72,852	227,249

APPENDIX II—*continued*

Season	Total Aust. (see note)	C.S.R. Mills			
		Queensland	N.S.W.	Fiji	Total C.S.R.
1932	532,652	123,096	18,567	140,871	282,534
1933	667,531	117,006	28,797	118,643	264,446
1934	643,252	98,735	30,682	114,491	243,908
1935	646,779	106,704	36,453	134,724	277,881
1936	782,412	134,846	38,151	151,884	324,881
1937	810,383	153,710	47,058	143,872	344,640
1938	823,231	132,290	45,095	137,049	314,434
1939	928,451	149,444	36,929	116,779	303,152
1940	806,477	123,065	47,031	121,883	291,979
1941	745,667	119,744	48,322	104,393	272,459
1942	649,961	105,812	44,281	139,560	289,653
1943	524,187	77,042	37,440	55,923	170,405
1944	669,963	105,423	26,423	65,358	197,204
1945	665,881	129,162	21,220	67,456	217,838
1946	551,854	105,445	39,768	119,120	264,333
1947	605,209	100,542	33,551	145,448	279,541
1948	943,046	158,288	32,997	137,081	328,366
1949	937,968	157,843	40,701	129,587	328,131
1950	921,099	150,456	41,255	99,195	290,906
1951	745,391	133,503	41,049	115,744	290,296
1952	948,877	174,982	14,263	133,645	322,890
1953	1,254,375	209,640	33,992	194,994	438,626
1954	1,326,409	234,499	26,290	136,831	397,620

Note : Total production of raw sugar in Australia from all sources, including C.S.R. mills, to 1899 arrived at by adding Queensland production as given in Queensland Registrar General's Reports and N.S.W. production as given in N.S.W. Statistical Register. Totals from 1900 arrived at by adding Queensland production as given in Reports of the Bureau of Sugar Experiment Stations (1900-04 estimated from 88 N.T. tonnage) to N.S.W. production estimated from tons tel quel in N.S.W. Statistical Register until 1911, and thereafter from C.S.R. records. Since 1912 C.S.R. has been the only raw sugar miller in N.S.W.

APPENDIX 12 · WORLD SUGAR PRODUCTION 1839-1954

Year	From Cane	From Beet	Total	Cane as % of Total
1839	781,716	38,602	820,318	95·1
1840	788,000	48,198	830,198	93·0
1841	829,000	50,919	879,919	94·2
1842	840,000	41,240	881,240	96·3
1843	909,000	46,911	955,911	95·0
1844	961,000	53,458	1,014,458	94·7
1845	1,003,000	60,857	1,063,857	94·2
1846	1,017,000	80,004	1,097,004	92·5
1847	1,067,000	96,346	1,163,346	91·7
1848	1,008,000	79,885	1,087,885	92·3
1849	1,070,000	110,737	1,180,737	90·7
1850	1,043,000	159,435	1,202,435	86·5
1851	1,186,000	163,757	1,349,757	87·6
1852	1,167,000	202,810	1,369,810	85·2
1853	1,284,000	194,893	1,478,893	86·9
1854	1,301,000	176,210	1,477,210	88·2
1855	1,243,000	246,856	1,489,856	83·5
1856	1,195,000	276,702	1,471,702	81·3
1857	1,220,000	370,004	1,590,004	76·7
1858	1,358,000	409,614	1,767,614	76·8
1859	1,438,000	387,539	1,825,539	78·8
1860	1,376,000	351,602	1,727,602	79·7
1861	1,466,000	413,671	1,879,671	78·1
1862	1,363,000	474,719	1,857,719	74·3
1863	1,334,000	457,146	1,791,146	74·5
1864	1,333,000	474,719	1,837,719	74·3
1865	1,506,000	680,685	2,195,685	69·5
1866	1,544,000	671,810	2,215 810	69·8
1867	1,499,000	687,281	2,186,281	68·4
1868	1,759,000	760,025	2,519,025	69·8
1869	1,728,000	821,141	2,549,141	68·0
1870	1,662,000	939,096	2,601,096	64·0
1871	1,697,000	976,915	2,673,915	63·5
1872	1,805,000	1,128,918	2,933,918	61·5
1873	1,848,000	1,198,463	3,046,463	60·7
1874	1,883,000	1,284 586	3,167,586	59·1

APPENDIX 12—*continued*

Year	From Cane	From Beet	Total	Cane as % of Total
1875	1,816,000	1,377,336	3,193,336	55·1
1876	1,792,000	1,085,204	2,877,204	62·4
1877	1,770,000	1,358,828	3,128,828	56·2
1878	1,873,000	1,615,934	3,488,934	53·7
1879	1,908,000	1,459,385	3,367,385	56·7
1880	1,883,000	1,857,210	3,740,210	50·2
1881	1,806,000	1,831,847	3,637,847	48·3
1882	2,079,000	2,173,409	4,252,409	48·9
1883	2,210,000	2,322,736	4,532,736	48·7
1884	2,225,000	2,549,672	4,774,672	46·6
1885	2,300,000	2,172,200	4,472,200	51·4
1886	2,400,000	2,686,700	5,086,700	47·2
1887	2,541.000	2,367,200	4,908,200	51·7
1888	2,359,000	3,555,900	5,914,900	40·0
1889	2,138,000	3,536,700	5,674,700	37·7
1890	2,597,000	3,679,800	6,276,800	41·2
1891	3,502,000	3,480,800	6,982,800	51·6
1892	3,040,500	3,380,700	6,421,200	47·3
1893	3,561,000	3,833,000	7,394,000	48·2
1894	3,531,000	4,725,800	8,256,800	42·7
1895	2,840,000	4,220,500	7,060,500	40·2
1896	2,842,000	4,801,500	7,643,500	37·2
1897	2,869,000	4,695,300	7,564,300	38·0
1898	2,995,000	4,689,600	7,684,600	38·5
1899	2,881,000	5,410,900	8,291,900	34·7
1900	5,252,987	6,005,868	11,258,855	46·6
1901	5,762,573	6,880,875	12,643,448	45·7
1902	5,844,062	5,699,912	11,543,974	50·6
1903	6,034,693	6,066,623	12,101,316	49·8
1904	6,265,160	4,919,599	11,184,759	56·0
1905	6,729,100	7,274,098	14,003,198	48·1
1906	7,124,083	7,244,550	14,348,633	49·5
1907	6,643,024	7,062,551	13,705,575	48·4
1908	7,372,492	6,985,539	14,358,031	51·3
1909	8,042,159	6,648,082	14,690,241	55·6
1910	8,155,837	8,667,980	16,823,817	48·5
1911	8,570,597	6,947,131	15,517,728	55·2

APPENDIX 12—*continued*

Year	From Cane	From Beet	Total	Cane as % of Total
1912	8,969,374	9,039,006	18,008,380	49·7
1913	9,661,165	9,053,561	18,714,726	51·6
1914	9,901,741	8,311,701	18,213,442	54·4
1915	10,610,774	6,110,312	16,721,086	60·3
1916	11,173,168	5,864,508	17,037,676	65·5
1917	11,709,952	5,153,113	16,863,065	69·3
1918	11,451,948	4,428,150	15,880,098	72·2
1919	11,862,480	3,350,292	15,212,772	78·0
1920	11,924,813	4,906,266	16,831,079	70·8
1921	12,739,983	5,129,597	17,869,580	71·4
1922	12,500,345	5,356,950	17,857,295	70·3
1923	13,520,002	6,059,212	19,579,214	69·1
1924	14,905,930	8,295,493	23,201,423	64·3
1925	15,140,542	8,617,960	23,758,502	63·8
1926	15,314,988	7,896,189	23,211,177	65·4
1927	15,953,278	9,164,489	25,117,767	64·0
1928	17,187,918	9,612,881	26,800,799	64·1
1929	17,381,525	9,248,802	26,730,327	64·3
1930	15,942,438	11,910,883	27,853,321	57·2
1931	16,215,707	8,781,604	24,997,311	64·8
1932	14,741,833	7,994,375	22,736,208	65·2
1933	15,112,736	9,159,470	24,272,206	63·0
1934	14,842,171	9,791,624	24,633,795	60·1
1935	16,598,262	10,430,394	27,028,656	58·8
1936	18,415,750	10,232,900	28,648,650	64·3
1937	18,781,839	11,193,620	29,975,459	62·7
1938	18,451,041	10,225,311	28,676,352	64·5
1939	19,394,841	11,116,481	30,511,322	66·7
1940	18,285,000	11,323,000	29,608,000	61·7
1941	17,939,000	8,391,000	26,330,000	68·1
1942	16,781,000	8,527,000	25,308,000	66·3
1943	17,615,000	7,323,000	24,938,000	70·6
1944	15,279,000	6,480,000	21,759,000	70·2
1945	15,194,000	6,094,000	21,288,000	71·3
1946	18,041,000	7,721,000	25,762,000	70·0
1947	19,631,000	7,947,000	27,578,000	71·2
1948	20,666,000	10,019,000	30,685,000	67·3

APPENDIX 12—*continued*

Year	From Cane	From Beet	Total	Cane as % of Total
1949	20,768,000	10,533,000	31,301,000	66·3
1950	22,137,000	13,298,000	35,435,000	62·4
1951	24,103,000	13,244,000	37,347,000	64·5
1952	23,234,000	13,246,000	36,480,000	63·7
1953	24,339,000	16,123,000	40,462,000	60·1
1954	24,819,000	15,038,000	39,857 000	62·2

Sources: 1839-1939 Deerr "History of Sugar".
1940-54 C. Czarnikow Ltd London.
1954 Estimated.

Note: Deerr comments ("History of Sugar" Vol. II pp. 485-6) that 1839 is the first year for which data approaching completeness are available. He states "The outputs of Russia before 1850 and of Belgium before 1852 are not available. The effect of these omissions is reflected in the sudden jump in beet-sugar production noticed in the years affected.

"While the beet-sugar output refers definitely to production, in much of the cane-sugar statistics, particularly those of earlier date, it is the exports which are quoted, with neglect of the internal consumption.

"Previous to 1900 the production of sugar in India does not appear in the statistics. There is then found for the year 1900 a jump in the cane-sugar production of over 2,000,000 tons. Equally the large production of south China, and of other Far Eastern countries is not included, and that of the Central and South American states only in the later figures. When all these factors are taken into consideration, it appears unlikely that the production of beet-sugar has in any year ever equalled that of cane, though for a number of years it was made to appear as if it accounted for two-thirds of the world's output. Actually this method of presenting the visible supply as total production was not accidental, as it suited the policy of beet-sugar producers and of the interests absorbing a large proportion of the supplies of beet-sugar (the confectionery and jam makers), and the doctrinaire free traders, to depreciate the position of the cane-sugar industry and to represent it as unworthy of support."

He also states (p. 499) "These statistics have been collected from many sources . . . No attempt has been made to correct for English or metric tons."

C.S.R. comment: We admire Mr Deerr's industry and patience in getting together statistics going back so far and covering so many countries. He indicates the reserve with which some of the figures should be treated and the reader should make allowances for the impossibility of attaining exactitude or even reconciliation in some cases.

APPENDIX 13 RAW SUGAR PRICES ON WORLD "FREE" MARKET 1728-1954

Average annual prices (or annual range of prices) in shillings sterling per cwt c.i.f. London to 1939, f.o.b. Cuba 1940-47, c. & f. London 1948-54

Year	Price	Year	Price	Year	Price	Year	Price
1728	24	1763	26–38	1798	59–83	1833	26–31
1729	24	1764	28–40	1799	26–87	1834	31–33
1730	22	1765	32–43	1800	32–70	1835	30–38
1731	20	1766	29–42	1801	32–75	1836	38–45
1732	18	1767	33–42	1802	26–55	1837	33–37
1733	17	1768	32–41	1803	30–58	1838	33–42
1734	26	1769	33–42	1804	46–66	1839	39
1735	19	1770	31–43	1805	48–59	1840	49
1736	19	1771	32–44	1806	39–49	1841	40
1737	25	1772	29–43	1807	32–38	1842	37
1738	22	1773	28–44	1808	32–50	1843	37
1739	26	1774	27–43	1809	36–51	1844	33
1740	32	1775	26–39	1810	43–54	1845	33
1741	30	1776	30–50	1811	35–45	1846	33
1742	21	1777	35–60	1812	42–49	1847	27
1743	27	1778	40–64	1813	51–75	1848	26
1744	31	1779	50–59	1814	54–97	1849	22
1745	40	1780	45–59	1815	57–75	1850	23
1746	39	1781	55–72	1816	49–60	1851	23
1747	43	1782	26–63	1817	44–54	1852	20
1748	32	1783	22–48	1818	47–55	1853	22
1749	29	1784	18–46	1819	36–51	1854	20
1750	28	1785	26–42	1820	34–37	1855	24
1751	30	1786	29–48	1821	29–35	1856	28
1752	39	1787	24–47	1822	28–34	1857	34
1753	33	1788	34–46	1823	27–37	1858	24
1754	36	1789	31–47	1824	30–34	1859	23
1755	36	1790	38–46	1825	32–41	1860	24
1756	35	1791	47–65	1826	30–39	1861	22
1757	37	1792	48–76	1827	32–36	1862	20
1758	42	1793	41–73	1828	32–38	1863	21
1759	31–47	1794	32–67	1829	26–30	1864	26
1760	32–48	1795	42–75	1830	23–25	1865	22
1761	32–50	1796	61–78	1831	23–25	1866	21
1762	27–47	1797	52–75	1832	23–30	1867	22

APPENDIX 13—*continued*

Year	Price	Year	Price	Year	Price	Year	Price
1868	22	1890	13/0	1912	13/1½	1934	4/8¾
1869	24	1891	13/6	1913	10/5½	1935	4/8
1870	23	1892	13/6	1914	19/2½	1936	4/8¾
1871	25/6	1893	14/3	1915	19/2½	1937	6/4¼
1872	25/6	1894	11/3	1916	21/9	1938	5/5
1873	22/6	1895	10/0	1917	26/11¼	1939	7/2
1874	21/6	1896	10/9	1918	24/7¼	1940 (a)	6/3
1875	20/0	1897	9/3	1919	30/4¼	1941	8/1½
1876	21/6	1898	9/6	1920	65/8¼	1942	14/8¾
1877	24/6	1899	10/6	1921	24/10½	1943	14/8¾
1878	20/0	1900	12/6½	1922	15/6¼	1944	14/8¾
1879	19/0	1901	10/6½	1923	25/9	1945	17/2¾
1880	20/6	1902	8/1	1924	21/9	1946	23/2¾
1881	21/3	1903	9/6½	1925	12/9	1947	27/7
1882	20/0	1904	11/0½	1926	12/3	1948 (b)	27/4½
1883	19/0	1905	12/4½	1927	13/9	1949	29/2
1884	13/3	1906	9/8¼	1928	11/7½	1950	43/9¾
1885	13/6	1907	10/5¼	1929	9/0½	1951	52/5½
1886	11/9	1908	11/4	1930	6/7	1952	39/2¾
1887	11/9	1909	11/7½	1931	6/3¾	1953	30/10¾
1888	13/0	1910	13/2¼	1932	5/9½	1954	29/5
1889	16/0	1911	13/4	1933	5/3		

Sources: Deerr "History of Sugar" to 1899.
C. Czarnikow Ltd London 1900-1954.

Notes: (a) For 1940-47 f.o.b. Cuba prices have been used in the absence of alternative information.

(b) For 1948-54 approximate c.&.f. London prices have been obtained by adding annual average freights to f.o.b. Cuba prices.

(c) As Deerr's annual ranges prior to 1900 indicate, prices fluctuate during each year. In the last 50 years the lowest price known to C.S.R. was 3/10½ c.i.f. London in November 1934. In 1920 prices exceeding 120/- c.i.f. London were paid.

(d) The tabulation shows main market fluctuations clearly but, because it is expressed in monetary units of changing real value, does not allow valid comparisons of prices between remote periods.

APPENDIX 14 DEVELOPMENT OF CANE FARMING IN FIJI 1925-55

Year	Total Area under Cultivation for Cane	Cultivated by							
		C.S.R. Company		European Planters		Indian and Fijian Tenants		Indian and Fijian Contractors	
		Acres	% of area	Acres	% of area	Acres	% of area	Acres	% of area
1925	64,963	33,679	52	4,446	7	6,905	10	19,933	31
1926	67,494	30,350	45	4,040	6	9,080	13	24,024	36
1927	70,526	28,828	41	3,677	5	11,448	16	26,573	38
1928	75,007	23,700	32	2,342	3	20,710	28	28,255	37
1929	77,645	20,025	26	2,004	3	25,559	33	30,057	38
1930	78,250	17,641	22	1,611	2	27,896	36	31,102	40
1931	78,373	12,610	16	1,133	1	34,300	44	30,330	39
1932	80,939	9,160	11	744	1	39,412	49	31,623	39
1933	83,692	7,450	9	645	1	43,077	51	32,520	39
1934	84,497	5,335	6	658	1	44,989	53	33,515	40
1935	87,738	4,874	5	661	1	45,690	52	36,513	42
1936	89,924	4,532	5	653	1	46,031	51	38,708	43
1937	91,197	4,500	5	717	1	46,139	50	39,841	44
1938	91,475	3,219	4	369	—	47,405	52	40,482	44
1939	91,812	3,126	3	240	—	47,421	52	41,025	45
1940	91,624	3,111	3	206	—	47,268	52	41,039	45
1941	92,628	3,153	3	161	—	46,521	50	42,793	47
1942	94,046	3,119	3	221	—	46,439	50	44,267	47
1943	90,913	2,728	3	197	—	45,383	50	42,605	47
1944	89,059	2,425	3	197	—	45,332	51	41,105	46
1945	89,843	2,389	3	197	—	45,633	51	41,624	46
1946	90,812	2,716	3	197	—	46,070	51	41,829	46
1947	92,286	2,899	3	197	—	46,753	51	42,437	46
1948	92,914	2,766	3	197	—	47,070	51	42,881	46
1949	93,511	2,787	3	202	—	47,492	51	43,030	46
1950	93,206	2,793	3	199	—	47,852	51	42,362	46
1951	96,006	2,735	3	199	—	48,356	50	44,716	47
1952	101,526	2,660	3	191	—	49,543	49	49,132	48
1953	104,162	2,634	3	489	—	50,461	48	50,578	49
1954	108,727	2,571	2	415	—	51,584	48	54,157	50
1955	110,854	2,571	2	391	—	51,791	47	56,101	51

Source: C.S.R. records.

APPENDIX 15 SIZE OF CANE FARMS IN FIJI 1955

Size of farm	Number of	
	Tenants	Contractors
Up to 7·9 acres	631	4,992
8 to 11·9 acres	2,174	1,609
12 to 15·9 acres	1,521	694
16 to 19·9 acres	330	308
20 to 29·9 acres	84	304
30 to 69·9 acres	2	82
70 acres or over	nil	4
Total	4,742	7,993

APPENDIX 16 ACRES UNDER CULTIVATION FOR SUGAR CANE, FIJI, 1950-55

Year	Total	For cutting this year		Plants for cutting next year	Fallow
		Plants	Ratoons		
1950	93,206	21,901	22,728	20,621	27,956
1951	96,006	18,945	22,858	34,033	20,170
1952	101,526	31,734	20,587	29,261	19,944
1953	104,163	28,660	32,371	29,111	14,021
1954	108,726	27,486	32,694	34,697	13,849
1955	110,854	34,494	30,544	33,881	11 935

APPENDIX 17 AUSTRALIAN RAW SUGAR MILLS AND THEIR OWNERS, 1955

Arranged in geographical order from the northernmost mill southwards

Name of Mill	*Owner*	*If Farmers' Co-operative*
Mossman	Mossman Central Mill Co. Ltd ...	Yes
Hambledon ...	The Colonial Sugar Refining Co. Ltd	
Mulgrave ...	Mulgrave Central Mill Co. Ltd ...	Yes
Babinda	Babinda Central Mill Co. Ltd... ...	Yes
Goondi	The Colonial Sugar Refining Co. Ltd	
Mourilyan ...	Australian Sugar Co. Pty. Ltd	
South Johnstone ...	South Johnstone Co-op. Sugar Milling Assn. Ltd	Yes
Tully	Tully Co-op. Sugar Milling Assn. Ltd	Yes
Macknade ...	The Colonial Sugar Refining Co. Ltd	
Victoria	The Colonial Sugar Refining Co. Ltd	
Invicta	Haughton Sugar Co. Ltd	
Pioneer	Pioneer Sugar Mills (Pty.) Ltd	
Kalamia	Australian Estates Co. Ltd	
Inkerman	Pioneer Sugar Mills (Pty.) Ltd	
Proserpine ...	Proserpine Co-op. Sugar Milling Assn. Ltd	Yes
Farleigh	Farleigh Co-op. Sugar Milling Assn. Ltd	Yes
Racecourse ...	Racecourse Co-op. Sugar Assn. Ltd ...	Yes
Pleystowe ...	Amalgamated Sugar Mills Ltd	
Marian	Marian Central Mill Co. Ltd	Yes
Cattle Creek ...	Cattle Creek Co-op. Sugar Milling Assn. Ltd	Yes
North Eton ...	North Eton Co-op. Sugar Milling Assn. Ltd	Yes
Plane Creek ...	Plane Creek Central Mill Co. Ltd ...	Yes
Millaquin	Millaquin Sugar Co. Ltd	
Qunaba	Millaquin Sugar Co. Ltd	
Fairymead... ...	Fairymead Sugar Co. Ltd	
Bingera	Gibson and Howes Ltd	
Gin Gin	Gin Gin Co-op. Sugar Milling Assn. Ltd	Yes
Isis	Isis Central Sugar Mill Co. Ltd ...	Yes
Maryborough ...	Maryborough Sugar Factory Pty. Ltd	
Moreton	Moreton Central Sugar Mill Co. Ltd	
Rocky Point ...	W. H. Heck and Sons Pty. Ltd	
Condong ...	The Colonial Sugar Refining Co. Ltd	
Broadwater ...	The Colonial Sugar Refining Co. Ltd	
Harwood	The Colonial Sugar Refining Co. Ltd	

NOTE: Marian, Mossman, and Plane Creek are believed to have a proportion of shares held by persons other than suppliers, but are generally regarded as co-operative mills.

APPENDIX 18 AUSTRALIAN RETAIL PRICE OF REFINED SUGAR, AND RETURN TO QUEENSLAND SUGAR INDUSTRY FROM DOMESTIC AND EXPORT SALES OF RAW SUGAR

Season	Refined Sugar Retail Price per lb. Capital Cities	Raw Sugar net return per ton 94 n.t. to Queensland Industry		
		From sales on Domestic Market	From sales of Exportable Sugar	Overall average to Q'ld "Pool"
		£ s. d.	£ s. d.	£ s. d.
1923	5d	——	——	——
1923 (Oct)	4½d	——	——	27 0 0
1924	4½d	——	——	26 0 0
1925	4½d	26 0 0	11 5 9	19 10 7
1926	4½d	26 15 0	14 18 10	24 10 10
1927	4½d	26 10 0	12 2 6	22 0 4
1928	4½d	26 13 6	10 10 0	20 17 11
1929	4½d	26 16 0	9 17 0	20 5 10
1930	4½d	27 0 0	8 5 0	19 10 1
1931	4½d	26 19 0	9 7 0	17 19 10
1932	4½d	25 2 3	8 5 9	18 16 2
1933 (Jan)	4d	23 18 6	8 0 6	16 3 6
1934	4d	24 0 0	7 11 3	15 10 6
1935	4d	24 0 0	7 18 9	16 3 8
1936	4d	24 2 0	7 19 0	15 4 8
1937	4d	24 0 0	8 6 0	15 6 5
1938	4d	24 0 0	8 4 3	15 2 2
1939	4d	23 12 6	10 7 6	15 15 3
1940	4d	23 1 0	11 5 6	17 2 8
1941	4d	22 13 0	10 18 9	17 18 5
1942	4d	22 14 6	10 16 3	19 0 6
1943	4d	22 10 6	13 2 6	21 1 3
1944	4d	22 2 0	15 0 6	19 16 1
1945	4d	21 18 0	16 17 9	20 6 1
1946	4d	21 18 0	21 10 0	21 16 10
1947 (Dec)	4½d	24 0 0	29 12 6	24 18 9
1948	4½d	23 1 0	28 2 0	25 9 11
1949 (Nov)	5d	24 6 0	29 7 6	26 14 10
1950	5d	24 11 0	32 16 6	28 5 4
1951 (Jul)	6½d	33 14 0	36 15 6	34 7 6
1952 (Mar)	8d	——	——	——
(Oct)	9d	44 3 0	41 2 0	42 12 3
1953	9d	47 18 6	39 18 0	42 7 11
1954	9d	47 1 0	38 16 6	41 4 9

Sources: C.S.R. records and Queensland Sugar Board accounts.

APPENDIX 19 MOVEMENTS IN AUSTRALIAN RETAIL PRICE OF SUGAR AND OTHER GOODS, AND IN WAGES

Base 1923-27 = 1,000

Year	Sugar	"C" Series Retail Price Index		Wages. Nominal weekly rates Adult Males
		Food and Groceries	All Items	
1923	1,000	1,009	1,003	964
1924	1,000	969	987	982
1925	1,000	998	997	993
1926	1,000	1,023	1,011	1,022
1927	1,000	1,000	1,002	1,039
1928	1,000	985	1,009	1,048
1929	1,000	1,044	1,033	1,053
1930	1,000	941	975	1,035
1931	1,000	826	873	935
1932	1,000	796	830	875
1933	889 (Jan)	751	804	846
1934	889	783	817	849
1935	889	806	832	861
1936	889	825	850	874
1937	889	851	873	911
1938	889	886	897	960
1939	889	927	920	985
1940	889	939	957	1,008
1941	889	947	1,008	1,066
1942	889	1,031	1,091	1,155
1943	889	1,037	1,131	1,233
1944	889	1,026	1,126	1,242
1945	889	1,034	1,126	1,249
1946	889	1,036	1,145	1,281
1947	1,000 (Dec)	1,100	1,188	1,387
1948	1,000	1,256	1,295	1,556
1949	1,111 (Nov)	1,394	1,415	1,714
1950	1,111	1,566	1,560	1,920
1951	1,444 (Jul)	2,041	1,883	2,400
1952	1,778 (Mar)	2,526	2,196	2,798
	2,000 (Oct)			
1953	2,000	2,641	2,302	2,957
1954	2,000	2,671	2,326	3,006

Sources: "C" Series—Commonwealth of Australia Year Book. Wages—From Commonwealth Year Book (base 1911 = 1,000) recalculated to base 1923-27 = 1,000.

APPENDIX 20 DISTRIBUTION OF AUSTRALIAN RAW SUGAR PRODUCTION

In tons 94 net titre

Season	Home Consumption	Exportable Sugar	Total
1925	289,159	227,002	516,161
1926	338,058	77,633	415,691
1927	350,025	158,599	508,624
1928	345,199	191,818	537,017
1929	335,150	202,913	538,063
1930	325,209	209,854	535,063
1931	303,418	301,434	604,852
1932	336,700	196,065	532,765
1933	347,479	319,300	666,779
1934	317,599	324,844	642,443
1935	336,541	312,204	648,745
1936	359,337	423,075	782,412
1937	364,917	444,935	809,852
1938	363,461	458,444	821,905
1939	383,453	544,694	928,147
1940	399,484	406,500	805,984
1941	440,928	304,321	745,249
1942	442,226	207,333	649,559
1943	434,128	89,666	523,794
1944	454,237	215,661	669,898
1945	455,888	209,956	665,844
1946	463,410	88,393	551,803
1947	498,551	106,503	605,054
1948	499,820	443,073	942,893
1949	497,302	439,635	936,937
1950	518,236	402,663	920,899
1951	587,745	157,346	745,091
1952	477,481	471,008	948,489
1953	521,809	732,208	1,254,017
1954	542,683	784,449	1,327,132

Sources: 1925-35 C.S.R. records.
1936-54 Queensland Auditor-General's Reports on Sugar Board Accounts.

Note: Above figures exclude small local sales of raw sugar to farmers and mill workers.

APPENDIX 21 DESTINATION OF AUSTRALIAN EXPORTS OF RAW SUGAR

In long tons, tel quel

Season	United Kingdom	Canada	New Zealand	Hong Kong	Ceylon	Other Countries	Total
1923	10,511	—	5,990	—	—	—	16,501
1924	53,299	12,320	5,701	—	—	—	71,320
1925	198,313	14,781	—	—	—	—	213,094
1926	39,621	33,448	—	—	—	—	73,069
1927	138,598	11,500	—	—	—	—	150,098
1928	180,834	5,943	—	—	—	—	186,777
1929	186,345	9,000	—	—	—	—	195,345
1930	197,208	5,504	—	—	—	—	202,712
1931	274,933	15,751	—	—	—	—	290,684
1932	139,195	48,995	—	—	—	—	188,190
1933	278,544	27,158	—	—	—	—	305,702
1934	259,831	52,144	—	—	—	—	311,975
1935	287,049	9,793	—	—	—	—	296,842
1936	344,051	63,715	—	—	—	—	407,766
1937	358,968	67,949	—	—	—	—	426,917
1938	391,496	50,290	—	—	—	—	441,786
1939	358,585	107,702	54,672	4,438	—	—	525,397
1940	184,340	96,039	88,541	—	—	—	368,920
1941	76,957	44,082	52,669	1,500	—	21,132	196,340
1942	14,371	7,000	31,413	—	—	7,502	60,286
1943	—	16,996	58,178	—	—	11,212	86,386
1944	—	25,830	74,792	—	—	15,323	115,945
1945	486	8,733	38,049	14,857	14,950	74,423	151,498
1946	14,168	—	22,436	1,100	—	49,542	87,246
1947	62,031	—	18,226	—	4,038	13,646	97,941
1948	320,772	36,851	48,152	—	—	—	405,775
1949	318,216	40,447	60,307	—	—	—	418,970
1950	233,723	93,507	53,540	—	—	—	380,770
1951	68,738	56,486	31,716	—	—	—	156,940
1952	358,483	25,914	51,768	—	17,379	—	453,544
1953	532,732	101,495	45,542	9,318	9,035	—	698,122
1954	443,115	92,082	65,947	39,961	9,519	95,957	746,581

Source: C.S.R. records.

Note: Above tonnages are those shipped direct to major overseas buyers. Small quantities sold as ships' stores etc. are not included.

APPENDIX 22 C.S.R. SALES OF REFINED SUGAR TO AUSTRALIAN MANUFACTURERS

In long tons, tel quel

Year ending 30 June	Sales to Manufacturers	Sales to Other Buyers	Total
1931	76,767	204,084	280,851
1932	81,257	208,325	289,582
1933	84,837	210,987	295,824
1934	85,713	207,392	293,105
1935	93,196	206,976	300,172
1936	101,440	206,227	307,667
1937	110,620	211,696	322,316
1938	117,087	208,542	325,629
1939	118,231	207,631	325,862
1940	135,028	217,108	352,136
1941	147,740	214,513	362,253
1942	166,072	243,431	409,503
1943	174,211	221,472	395,683
1944	181,696	220,936	402,632
1945	169,752	210,565	380,317
1946	189,299	221,371	410,670
1947	203,605	209,585	413,190
1948	215,549	221,987	437,536
1949	215,426	231,639	447,065
1950	214,271	232,068	446,339
1951	234,516	229,185	463,701
1952	241,660	255,472	497,132
1953	199,847	212,092	411,939
1954	214,034	233,107	447,141
1955	225,632	235,790	461,422

Source: C.S.R. records.

Note: "Manufacturers" in this context are those who purchase at least 12 tons of sugar per year for manufacturing purposes. Most of the sugar sold to "Other Buyers" goes to the grocery trade but includes also sugar sold to small processors not listed as "manufacturers" by the company. The proportion of sugar used by manufacturers steadily increased over many years until 1947; since then it has amounted to about half the sugar used in Australia. Sales of refined sugar shown above include also some sales of raw sugar to certain manufacturers, and to the grocery trade.

APPENDIX 23 THE "P.O.C.S." FORMULA

The "P.O.C.S." formula was evolved by Dr Gustav Kottmann of the C.S.R. in the 80s of last century as a means of calculating the amount of cane sugar in sugar cane capable theoretically of being recovered by milling, if certain very high standards of milling performance could be reached. It thus provided a standard for measurement of the performance of a mill on cane of varying quality. From 1899 it has provided a basis for paying farmers on the sugar content and other qualities of their cane. The P.O.C.S. (Pure Obtainable Cane Sugar) formula was incorporated into Queensland cane prices legislation in 1915 under the name of the C.C.S. (Commercial Cane Sugar) formula.

The measure of the recoverable sugar content of cane determined by the use of this formula is referred to as the "P.O.C.S." or the "C.C.S." of a cane. One speaks of "cane of 16 P.O.C.S. or 16 C.C.S." It is *not* a percentage measure of the sugar in cane, but of the percentage of *recoverable* sugar in cane (a), assuming certain standards of factory efficiency and accepting certain postulates in this empirical formula.

For practical purposes, cane consists of juice and fibre. The miller separates the juice from the fibre by crushing, and then extracts sugar from the juice. The juice also contains other soluble matter such as mineral salts, other sugars and organic compounds. These are known as "impurities".

The proportions in which *fibre*, *sugar* and soluble *impurities* are present in the cane has a bearing upon the amount of sugar that the miller can extract from the cane (b).

Cane varies considerably in fibre, sugar and impurity content—even when the variety is the same. Considerable differences occur from variety to variety and as the season progresses, as the following figures indicate:

Mill Area	*Date*	*Variety of Cane*	% *Fibre*	% *Sugar*	% *Impurities*	% *"P.O.C.S."*
Goondi	June '55	Pindar	10	9.69	2.66	8.36
	Sept '55	Badila	9	15.57	1.83	14.65
B'water	July '55	Trojan	15	15.04	2.10	13.99
	Aug '55	Vesta	14	14.58	1.44	13.86
Macknade	July '55	Pindar	12	13.70	2.20	12.60
	Sept '55	,,	12	16.19	1.66	15.36

It is not practicable to analyse the cane itself and the desired result is obtained in the manner explained below.

As already mentioned, cane consists of juice and fibre. If the fibre content can be ascertained the remainder, the juice, is known. Then, if we can ascertain the constituents of the juice, the various components of the whole cane can be stated. The task can be set out as follows: determine (1) the fibre (which gives the juice by difference) and (2) the proportions in which the various constituents are present in the juice, viz. the *sugar*, the *soluble impurities* and the remainder of the juice which is *water*. (The water provides a vehicle which carries the soluble solids—i.e., the sugar and the soluble impurities; the water is finally separated from the soluble solids by evaporation in the manufacturing process.)

The percentage of *fibre* in the cane is found by shredding a sample of cane, weighing it, soaking it in water to dissolve out the juice, and then drying the fibres and weighing them. The weight of the dried fibres related to the weight of the original cane gives the proportion of fibre.

We still have to obtain the "breakdown" of the juice. A sample is taken of the juice of each batch of cane as it comes from the front of the first set of rollers, before the juice becomes diluted with the hot water which is added in the main crushing process. This juice is known as "first roller juice". From the sample of juice the percentage of sugar in the juice is determined by the saccharimeter (c).

Then the following calculation is made:

$$\% \text{ CS in cane} = \frac{\% \text{ CS in 1RJ} \times [100 - (\% \text{ fibre} + 5)]}{100}$$

where % CS in cane = percentage cane sugar in the cane

1RJ = first roller juice

% fibre = percentage fibre in the cane

(The factor "5" was added to the % fibre as a result of practical factory measurements) (d).

Before the percentage of *soluble impurities* in the cane can be found it is necessary to find the amount of total soluble matter (i.e., sugar and soluble impurities). Another simple formula is used, but to use it, it is necessary to know the "density" of the first roller juice, which is measured by a hydrometer, calibrated in the Brix scale. The calculation then used is:

$$\% \text{ SS} = \frac{^\circ \text{Brix of 1RJ} \times [100 - (\% \text{ fibre} + 3)]}{100}$$

where % SS = percentage soluble solids in cane

° Brix = density according to Brix scale

(The factor "3" was added to the % fibre as a result of practical factory measurements) (d).

The amount of soluble impurities can now be found by subtracting the sugar from the total soluble solids, thus—

$$\% \text{ SS} - \% \text{ CS} = \% \text{ soluble impurities in cane}$$

Having thus arrived at the proportions of the main constituents *actually* in the cane (fibre, sugar, and impurities) the amount of sugar *recoverable* from the cane according to Dr Kottmann's formula is calculated by using the P.O.C.S. formula itself:

$$\% \text{ P.O.C.S.} = \% \text{ CS in cane} - \frac{\% \text{ soluble impurities in cane}}{2}$$

This formula for the calculation of recoverable sugar was arrived at by assuming certain standards of milling efficiency, which standards, Dr Kottmann postulated, should be set at higher levels than attainable. He referred to this as an unconquered margin for future attainment. The standards assumed are:

1. That there is no loss of sugar in the crushing and manufacturing process beyond that retained in the molasses.
2. That one-fourth of the soluble impurities are removed by clarification (coagulation of impurities in cane juice, precipitation and filtration) leaving three-fourths of them to pass to the residual molasses.
3. That the soluble solids in residual molasses consist of 40 per cent of sucrose and 60 per cent of impurities.

NOTES:

(a) Pure Obtainable Cane Sugar means pure refined sucrose—not commercial raw sugar.

(b) The P.O.C.S. formula is not sensitive to the somewhat different effects of the various constituents of the soluble impurities.

(c) Where the words "sugar" and "cane sugar" are used without qualification or without other distinctive implication in this appendix they refer to polarization as read on the saccharimeter.

(d) The "first roller juice" is somewhat richer than the whole juice in the cane, and this is allowed for by adding 5 and 3 to the fibre as shown in the formulae.

APPENDIX 24 SUGAR AND TOOTH DECAY

"For many years there has been a widespread impression among dentists and the laity that dental caries is intimately associated with the amount and form of the sugar intake, but scientific proof of the validity of this impression has been lacking." Extract from British Medical Council report, February 1955.[1]

"It is not known whether there is a relation between the sugar and refined carbohydrate content of an adequate diet and the dental caries susceptibility." Extract from a report prepared for the Food and Nutrition Board, United States National Research Council, 1952.[2]

"The fact that children on a high sugar dietary . . . (Institution I) outscored [in dental rating] those with lesser sugar intake but poorer dietaries is worthy of note . . . The dietary of the children in this study was considerably higher than that of the aforementioned investigations in other forms of carbohydrate, with the dental scores in direct order of total caloric intake, and in direct order of sugar intake. With respect to Institutions II and III, it appears significant that the two groups of children yielded dental scores in the same order as the presumed adequacy of the dietaries, and in direct order of the sugar intake. In short, a high sugar intake was not antagonistic to a good dental status." Extract from a monograph of the Society for Child Development, 1949.[3]

The British Medical Council report quoted above published the results of observations over two years of children, in a number of residential homes in England, all of whom were "getting enough calories, protein, mineral salts and vitamins, according to required standards". Control groups of children remained on their normal diets, while test groups were given up to 22 ounces a week extra sugar. The authors state, "The results of the investigations are, in the main, clear cut and therefore can be stated quite briefly. They demonstrate that relatively great differences in the total sugar content of the diets of children in institutions had no significant effect on the initiation or spread of dental caries in periods of 1 to 2 years."

In the United States report, also quoted above, the Chairman of the Food and Nutrition Board comments that, despite ten years of persistent labour on the part of the Committee for Dental Health, "The ultimate object remains to be reached. The causes of dental caries are only partially under-

[1] British Medical Research Council Special Report Series No. 228 The Effect of Sugar Supplements on Dental Caries in Children by J. D. King, D.Sc., F.D.S.R.C.S., May Mellanby, M.A., Sc.D., H. H. Stones, M.D., M.D.S., F.D.S.R.C.S., and H. N. Green, M.A., M.D., M.Sc., published by Her Majesty's Stationery Office and dated 3 February 1955.

[2] A Survey of the Literature of Dental Caries prepared for the Food and Nutrition Board, National Research Council, under the supervision of the Committee on Dental Health, and published as Publication No. 225, National Academy of Sciences, National Research Council, Washington, D.C., in 1952.

[3] A Study of Institutional Children with particular reference to the Caloric Value as well as other factors in the Dietary published by the Society for Research in Child Development, National Research Council, Washington, D.C., in 1949.

stood at present . . ." In the same publication J. H. Shaw, Assistant Professor of Dental Medicine at Harvard University warns "In any study of the relation of carbohydrates to dental caries activity, the adequacy of the diet in question must be guaranteed. This has not been done in a large number of experiments where the refined carbohydrate content of the ration has been increased."

A recent Australian publication *Eat for Health*, compiled by "a team of experts from the Preventative Dentistry Sub-Committee of the Australian Dental Board (Victorian Branch)", is less cautious than the authorities quoted above in claiming an irrefutable causal relation between dental caries and sugar consumption. It is asserted, without qualification, that "ninety per cent of dental decay comes from sugar and ten per cent from starch". "Sugar rots teeth," the publication states, and adds " . . . For most people the only thing necessary for the prevention of most, if not all, new cavities forming in their teeth is an act of will power. Cut out—or drastically reduce—the consumption of refined carbohydrates in all their forms, and a vast array of laboratory and clinical evidence will assure you of freedom from further dental decay."[4]

[4] Eat for Health a "programme for health by the Preventative Dentistry Sub-Committee of the Australian Dental Association (Victorian Branch)" published by Colorgravure Publications (The Herald & Weekly Times Ltd.) Melbourne, Victoria. Undated (c. 1954).

APPENDIX 25 SOURCE OF IMPORTS OF RAW SUGAR INTO NEW ZEALAND 1930-55

In long tons, tel quel

Year ending 30 June	Java	Cuba	Peru	San Domingo	Fiji	Australia	Total
1930	7,690	42,903	20,802	—	9,256	—	80,651
1931	45,151	14,783	—	—	8,592	—	68,526
1932	69,410	—	—	—	5,917	—	75,327
1933	55,530	15,735	—	—	5,500	—	76,765
1934	68,545	7,687	—	—	2,190	—	78,422
1935	61,847	7,875	—	—	1,116	—	70,838
1936	39,435	15,752	—	15,750	1,132	—	72,069
1937	67,646	7,875	—	7,267	1,468	—	84,256
1938	61,065	—	—	15,737	1,425	—	78,227
1939	81,421	—	—	7,350	493	—	89,264
1940	8,050	—	7,875	7,500	—	48,493	71,918
1941	—	—	—	—	—	94,756	94,756
1942	—	—	—	—	34,593	52,669	87,262
1943	—	—	—	—	40,358	31,413	71,771
1944	—	—	—	—	29,439	58,178	87,617
1945	—	—	—	—	19,085	60,133	79,218
1946	—	—	—	—	23,291	49,937	73,228
1947	—	—	—	—	64,058	25,207	89,265
1948	—	—	—	—	73,182	17,495	90,677
1949	—	—	—	—	32,954	48,673	81,627
1950	—	—	—	—	39,784	60,517	100,301
1951	—	—	—	—	15,040	53,540	68,580
1952	—	—	—	B.W.I. 14,350	50,152	31,716	96,218
53	—	—	—	Formosa 8,200	33,629	51,768	93,597
1954	—	6,493	7,958	—	35,064	45,542	95,057
1955	—	—	—	—	34,157	60,781	94,938

Source: C.S.R. records.

APPENDIX 26 MUNITION MANUFACTURE AND DEFENCE PROJECTS BY C.S.R. 1939-45

Produced in addition to established manufactures, which included raw and refined sugar, distillery products, and building materials.

Project or Product	*Remarks*
POWER ALCOHOL ...	Four grain distilleries were designed and erected in New South Wales, Victoria, South Australia and Western Australia for the Commonwealth Government. These were designed for a total production of 12 million gallons of power alcohol per annum, using wheat as raw material.
ETHER	The design of a plant for the manufacture of ether was adapted and the fabrication and erection of the plant supervised at an explosives factory.
GLYCERINE	A pilot plant was developed and glycerine for explosives was made from sugar.
ACETONE	A plant for the manufacture of acetone for cordite was fabricated, erected and operated.
GAS-MASK CARBON ...	A factory was built and operated for the manufacture of activated carbon from coconut shell.
VITAMIN C	A plant was developed and vitamin C (ascorbic acid) was manufactured for supply to the defence forces.
18-POUNDER AND 25-POUNDER SHELLS ...	1,600,000 shells were made in a workshop annexe specially built for the purpose.
GUN BARRELS	25-pounder gun barrels, jackets and other parts were machined.
SIGNAL PISTOLS	25,000 signal pistols and spare parts were manufactured.
MACHINE TOOLS, ETC. ...	Special purpose lathes for machining bombs were designed, manufactured, and operated; toggle presses for cartridge cases and much other equipment of a similar nature were also manufactured.

APPENDIX 27 RESEARCH AND DEVELOPMENT IN C.S.R.

Expenditures on industrial research in the more advanced countries have been consistently increasing year by year for a considerable period. Research is now an accepted tool of management. Naturally, the type of research and its extent varies with different classes of industry and business and with the size of the organization concerned. The need for research seems to arise from the basic necessity for an organization to grow. In a developing and competitive economy no organization can stand still without endangering itself. Nationally, research is an important factor in achieving greater productivity, on which our living standards and material welfare depend.

In its broadest sense research is the "endeavour to discover facts by the scientific study of a subject". There are a number of different kinds of research and a number of different ways of carrying it out. Industrial enterprises are generally concerned with what is called "basic research", "applied research" and, finally, with the function of "development" which can be described as the process of utilizing research findings for a practical and economic end. Sometimes one can see in particular instances a clear distinction between "research" and "development"; often it is difficult to see, particularly when the two functions are carried out by the same man or the same group. In general, industrial organizations are not concerned directly with pure research, which is looked on as a function of bodies such as universities. Industrially, we seek knowledge as a means to an end and not as an end in itself. Pure research naturally has contributed very greatly to our present state of knowledge and will continue to do so.

Research can be carried out in a number of different ways: by using consultants; by contributing towards co-operative research projects with government organizations such as the Commonwealth Scientific and Industrial Research Organization, or with trade associations; by the setting up of an individual research organization within a company; and by arranging for officers with the necessary abilities to carry out research and investigations in conjunction with production and selling.

Each of the various methods has advantages and disadvantages but all can be utilized where appropriate. In general, as the need for research is established in a company, the tendency is for a company's own internal research groups to grow in size and spread of activities. In C.S.R. we use all forms of research: we use consultants on specific tasks; we collaborate in co-operative ventures with universities and the Commonwealth Scientific and Industrial Research Organization; we subscribe to sugar industry research of the trade association type; and, finally, we have our own chemical and physical research department, agricultural research stations and the development activities appropriate to putting research findings into practice. These different research activities are not overlapping but are complementary and we believe it is of the highest importance to remain flexible in approach.

Methods engineering, work study and work simplification, management

and organizational study, market and consumer research investigation are all part of research and development, although not always so regarded. There is also the comparatively recent mathematical and statistical technique known as "operations research"; this, too, we have commenced to use.

Industrial research involves much more than purely scientific or technical skills; it cannot flourish or be effective in an organization unless the climate of opinion is favourable. In a recent talk on the subject of research, arranged by the Sydney University Extension Board, Dr J. Vernon of this company illustrated the point by reference to the introduction of a system of chemical control into the company's factories in the 1880s. He said:—

> Over 70 years ago, round about 1880, the then general manager, Mr E. W. Knox, apparently became dissatisfied with the general efficiency of our sugar mills and decided to do something about it with a view to improvement. He accordingly engaged two chemists from overseas, one from Germany and one from Scotland—Dr Kottmann and Mr Walton. Either by luck or by good judgment, he obtained two men each remarkable in his own way. Dr Kottmann, a chemist from the German beet sugar industry, was turned loose to investigate the efficiency of our sugar milling process and, using methods which we now would regard as quite commonplace, made some remarkable advances in the milling process, mainly in the direction of reducing the loss of recoverable sugar, which was previously taking place. He, together with Mr Walton, set about recasting the factory control methods and introduced a complete system of chemical control, involving the checking of every stage of the factory process from the time the cane entered the mill until the finished sugar emerged in bags.
>
> Looking back on it all from this long distance, the achievement serves as a nice illustration of the ideas which I have just been discussing. You will notice the sequence of events. First, the general manager of the company becoming dissatisfied with the technical efficiency of the process and wondering whether a technical investigation would bring to light new facts which would enable the process to be improved. Second, his determination to enlist good outside men, with special skills which he could not then obtain within his organization. Third, the carrying out of a sound and effective piece of research by these two men into the factory processes. Fourth, the immediate recognition by the general manager that their findings were sound and worthwhile, and the taking by him of forceful steps to bring them into actual working practice.
>
> This may sound rather a simple story but viewed against the background and the state of knowledge of over seventy years ago it is remarkable. At that time there were no chemists employed in the sugar industry in Australia and, indeed, very few in the world, outside some of the beet sugar factories in Germany and some of the Scottish sugar refineries. Mr Knox was not a technical man, yet he conceived

the problem, took the then unusual step of engaging outside chemical men to aid him and, once the technical results had been achieved, used all his energies and influence to see that they were adopted promptly and effectively in the factories under his control. Basically, the successful research, in this instance, sprang from the active and restless mind of the general manager.

C.S.R. Research and Development Projects, 1954

A brief list of some of the research and development projects undertaken by C.S.R. during 1954 in factory processing and cane-growing may be of interest. These projects had three aims: to improve quality of products, to reduce costs of manufacture or of agriculture and to increase capacity of factories or of farms. The company has in the past also devoted considerable attention to the investigation and development of new products, and is currently engaged on several research projects of this nature. During 1954 about 55 technical officers were engaged full-time on the work listed and much additional research and development was carried out by the operating staff throughout the company.

Chemical Research Department

Filterability of raw sugars was investigated and progress made towards finding the basic causes of bad filtration characteristics.

Temporary raw sugar storage was investigated with four outdoor stacks, each of 1,500 tons.

Hardening of raw sugar in storage was discussed with the University of Sydney, and a scholarship in this field granted by C.S.R.

Flotation of carbonatation slurries was the subject of co-operative research with the Commonwealth Scientific and Industrial Research Organization.

Phosphatation flotation was tried out successfully with 18 different raw sugars from Queensland.

Carbonatation trials were continued with a small pilot plant.

Bone char investigations were carried out in conjunction with the Refinery Development Section.

Distillery fermentation investigations resulted in improved techniques in the use of ammonium sulphate for regulating rates of fermentation. A University consultant was retained to discuss basic aspects of distillery work.

Properties of blue asbestos were measured, principally in relation to its use in the manufacture of asbestos cement.

Methods of measuring rates of crystallization, methods of analysis, selection of instruments and other matters formed the subject of minor investigations.

Mill Engineering Department

Bulk raw sugar installations were developed and installed at Harwood Mill, and advanced sufficiently to load in bulk at Broadwater Mill.

Mill Chemical Department

Clarification control was improved by using photo-electric turbidimeters, and the use of a polyelectrolyte in clarification of mill juices was investigated.

Technical Field Department

43,000 cane seedlings were raised. Three new C.S.R. varieties were adopted in Queensland.

Yellowing disease of cane in Fiji was investigated, its causes discovered and control measures developed.

Refinery Development Section

Control instruments were investigated and a plan evolved for their extensive use in affination and carbonatation.

A continuous centrifugal machine was installed at the affination station, Pyrmont.

Phosphatation flotation was investigated and proposed for Cottesloe refinery.

Plant extensions at Yarraville included an additional pan, a cooler, effets and automatic control instruments.

Building Materials Division

Output of Timbrock was increased as the result of a detailed process investigation.

Quality of Vinylflex plastic floor tiles was improved by investigation of manufacturing technique.

Process investigations were conducted into the manufacture of "Gyprock", "Cane-ite" and Concord Plaster.

APPENDIX 28 ORIGINAL SHAREHOLDERS OF C.S.R. 1855

Showing shares held and voting rights (note limitation)

Name	Number of Votes	Number of Shares	Amount
			£
Challis, J. H.	40	200	10,000
Cooper, Daniel	40	300	15,000
Griffiths, Fanning & Co.	40	300	15,000
Lamb, Spry & Co.	20	100	5,000
Walter Lamb & A. Spry	40	200	10.000
Walker, W. & Co., Jr.	40	240	12,000
Walker, A.	12	60	3,000
Tooth, R. J. & F.	40	400	20,000
Robey, James	40	200	10,000
Knox, Edward	40	1,000	50,000
	352	3,000	£150,000

Source: C.S.R. records.

APPENDIX 29 PROPORTION OF C.S.R. SHARES HELD IN VARIOUS COUNTRIES 1954

Where held	Holdings		Shares	
	Number	Per cent of Total	Number	Per cent of Total
Australia	9,625	77·2	602,198	85·8
Fiji	34	0·3	1,289	0·2
United Kingdom	160	1·3	19,835	2·8
New Zealand	2,607	20·9	77,497	11·0
Other British Countries	27	0·2	609	0·1
Foreign	18	0·1	572	0·1
	12,471	100·0	702,000	100·0

Source: From analysis of C.S.R. share holdings as at May 1954.

APPENDIX 30 OCCUPATIONS OF INDIVIDUAL MEN HOLDING SHARES IN C.S.R. 1954

As stated on registration.

Accountants

122 Accountants
1 Actuary
25 Chartered Accountants
25 Public Accountants

Agents, Brokers and Salesmen

14 Agents
1 Business Representative
11 Commercial Travellers
3 Commission Agents
8 Company Representatives
1 Customs House Agent
18 Estate Agents
1 Farm Produce Agent
6 Insurance Brokers
3 Insurance Representatives
16 Manufacturers' Agents
1 Motor Salesman
1 Rubber Broker
35 Salesmen
1 Sales Representative
47 Sharebrokers
1 Shipbroker
9 Stock and Station Agents
9 Stockbrokers
1 Textile Salesman
8 Travellers
5 Wool Brokers

Architects

30 Architects
1 Naval Architect

Artisans & Tradesmen

2 Apprentices
1 Artisan
1 Assembler

Artisans & Tradesmen—continued

1 Bacon Curer
1 Bootmaker
1 Brass Moulder
3 Bricklayers
1 Brickmaker
1 Boilermaker
2 Cabinetmakers
2 Cable Operators
6 Carpenters
1 Carpet Planner
2 Dental Mechanics
1 Die Caster
2 Electrical Fitters
4 Electricians
1 Engraver
4 Fitters and Turners
1 French Polisher
1 Furnaceman
1 Instrument Repairer
3 Joiners
1 Locomotive Driver
3 Mechanics
2 Motor Mechanics
2 Painters
1 Patternmaker
1 Piano Tuner
1 Pipe Fitter
5 Plumbers
5 Radio Technicians
1 Signalman
1 Sugarboiler
1 Telephone Mechanic
1 Toolmaker
1 Watchmaker
1 Wireless Operator
7 Woolclassers

Business Proprietors & Entrepreneurs

1 Advertising Specialist
1 Art Dealer
1 Auctioneer
3 Bakers
1 Billiard Room Proprietor
1 Bookseller
14 Builders
2 Butchers
1 Cafe Proprietor
2 Carcase Butchers
1 Caterer
42 Chemists
2 Chiropodists
1 Company Proprietor
3 Confectioners
12 Contractors
1 Dispensing Chemist
5 Drapers
1 Entrepreneur
1 Flat Proprietor
1 Flour Miller
1 Funeral Director
9 Garage Proprietors
7 Grocers
3 Hairdressers
1 Haulage Contractor
1 Herbalist
1 Hire Car Proprietor
1 Horse Dealer
9 Hotelkeepers
5 Hotel Proprietors
4 Ironmongers
5 Jewellers
1 Launch Proprietor
1 Law Bookseller
1 Master Baker
6 Master Builders
1 Master Butcher
2 Master Carriers
1 Master Cutler
2 Master Tanners

Business Proprietors & Entrepreneurs —continued

2 Mercers
1 Messenger Service Proprietor
1 Mill Owner
2 Motor Dealers
1 Motor Proprietor
7 Newsagents
1 Newspaper Proprietor
2 Opticians
3 Optometrists
1 Pastrycook
6 Pharmaceutical Chemists
4 Printers
6 Publicans
4 Publishers
1 Restaurant Proprietor
4 Retailers
3 Sawmillers
5 Shopkeepers
1 Sign Expert
1 Sports Store Proprietor
3 Stationers
24 Storekeepers
4 Tailors
4 Tobacconists
5 Warehousemen

Company Directors

271

Dentists

25 Dental Surgeons
33 Dentists

Doctors

59 Doctors
326 Medical Practitioners
15 Medical Students
5 Ophthalmic Surgeons
1 Oral Surgeon
12 Physicians

Doctors—continued
1 Radiologist
27 Surgeons

Educationists and Writers
2 Authors
6 Headmasters
15 Journalists
1 Lecturer
2 Newspaper Employees
1 School Inspector
37 School Teachers
2 University Lecturers
10 University Professors
2 University Registrars
1 University Vice Chancellor

Engineers
4 Chartered Engineers
4 Chemical Engineers
17 Civil Engineers
3 Consulting Engineers
1 Designing Engineer
9 Electrical Engineers
167 Engineers
2 Gas Engineers
8 Mining Engineers
2 Motor Engineers
1 Research Engineer
1 Telegraph and Cable Engineer

Farmers and Primary Producers
1 Bee Farmer
5 Dairy Farmers
178 Farmers
5 Fruit Growers
306 Graziers
2 Market Gardeners
12 Orchardists
45 Pastoralists
4 Planters
5 Poultry Farmers

Farmers and Primary Producers—continued
2 Primary Producers
1 Rice Farmer
5 Settlers
11 Station Managers
1 Tea Planter
1 Vigneron

Managers and Company Officers
2 Advertising Managers
3 Airways Officers
12 Bank Clerks
1 Bank Inspector
24 Bank Managers
52 Bank Officers
2 Business Executives
1 Buyer
1 Chartered Secretary
1 Colliery Manager
3 Company Executives
87 Company Managers
47 Company Officers
24 Company Secretaries
1 Departmental Head
9 Departmental Managers
4 Factory Managers
1 Industrial Officer
7 Insurance Inspectors
5 Insurance Managers
5 Insurance Officers
50 Managers
1 Mine Manager
1 Newspaper Executive
2 Production Managers
1 Refinery Manager
13 Sales Directors & Managers
23 Secretaries
1 Shipping Manager
7 Shipping Officers
1 Stock and Property Officer
2 Store Managers

Managers & Company Officers —continued

1 Theatre Manager
3 Trustee Company Officers
1 Wharf Manager
1 Wholesale Buyer
4 Works Managers

Members of the Armed Services

5 Air Force Officers
1 Air Force Trainee
28 Army Officers
1 British Army Officer
1 Chief Petty Officer
16 Members of the A.I.F.
17 Members of the Forces
8 Members of the R.A.A.F.
5 Members of the R.A.N.
12 Naval Officers
2 Naval Surgeons

Members of the Legal Profession

1 Advocate
52 Barristers
1 Judge's Associate
15 Law Clerks
2 Magistrates
1 Member of Industrial Commission
166 Solicitors
1 Stipendiary Magistrate

Merchants and Manufacturers

1 Brush Manufacturer
1 Cutlery Merchant
1 Fur Merchant
1 Gem Merchant
2 Hide and Skin Merchants
10 Importers
7 Indenters
1 Instrument Manufacturer
1 Jute Merchant

Merchants & Manufacturers—contd.

27 Manufacturers
109 Merchants
1 Produce Merchant
1 Silk Merchant
3 Timber Merchants
4 Wool Merchants

People of Various Occupations

3 Actors
4 Airline Pilots
2 Airmen
3 Analysts
5 Artists
1 Art Student
1 Aviator
3 Barmen
1 Baron
1 Biologist
1 Boatbuilder
4 Brewers
1 Brewery Employee
1 Builder's Assistant
1 Bus Driver
1 Caretaker
1 Chef
12 Clergymen
211 Clerks
1 Coal Miner
1 Doctor of Science
8 Draughtsmen
2 Economists
1 Entomologist
1 Fire Assessor
2 Fire Brigade Employees
2 Foremen
2 Freeholders
1 Gardener
1 Gas Worker
1 Gatekeeper
4 Gentlemen
1 Geologist

People of Various Occupations—contd.

209 Independent Means
18 Industrial Chemists
1 Industrial Consultant
33 Investors
11 Jackeroos
2 Labourers
1 Launch Driver
1 Librarian
1 Marine Steward
1 Marine Surveyor
12 Master Mariners
1 Metallurgist
1 Mine Surveyor
2 Monumental Masons
2 Munition Workers
5 Musicians
1 Oil Refiner
2 Organizers
4 Overseers
1 Packer
2 Passenger Managers
1 Pastoral Inspector
2 Photographers
2 Physicists
1 Plant Pathologist
2 Priests
1 Process Worker
1 Professional Cricketer
1 Property Owner
1 Radio Producer
1 Receiving Clerk
5 Research Chemists
1 Research Forester
1 Schooner Master
3 Scientists
1 Seaman
4 Shipping Clerks
2 Shipping Representatives
5 Ships' Officers
3 Shop Assistants
1 Staff Trainee

People of Various Occupations—contd.

1 Station Hand
1 Statistician
3 Storemen
57 Students
3 Survey Assistants
11 Surveyors
1 Tennis Coach
1 Textile Expert
1 Transport Officer
4 University Students
2 Veterinary Surgeons
1 Watchman
1 Waterside Worker
1 Wool Appraiser
23 Wool Buyers
1 Y.M.C.A. Leader

Public Servants

1 Administrator
1 Assistant Controller
2 City Council Employees
1 City Valuer
29 Civil Servants
2 Forestry Officers
1 Guard
3 Health Inspectors
4 Inspectors
2 Lands Inspectors
3 Members of Diplomatic Service
1 Minister of the Crown
1 Patrol Officer
2 Police Constables
3 Police Officers
3 Postal Employees
1 Postmaster
1 P.M.G. Official
21 Public Servants
2 Railway Clerks
2 Railway Employees
1 Shire Clerk

Public Servants—continued

1 Sydney County Council Employee
1 Town Clerk
1 Tramway Inspector

Retired Persons

292 Retired
8 ,, Army Officers
5 ,, Bank Managers
6 ,, Bank Officers
2 ,, Chemists
3 ,, Civil Servants
1 ,, Clergyman
6 ,, Company Officers
1 ,, Contractor
9 ,, Engineers
12 ,, Farmers

Retired Persons—contd.

1 ,, Foreman
22 ,, Graziers
1 ,, India Merchant
1 ,, Investor
2 ,, Magistrates
3 ,, Managers
3 ,, Master Mariners
2 ,, Medical Practitioners
1 ,, Milliner
5 ,, Naval Officers
1 ,, Newsagent
2 ,, Orchardists
3 ,, School Teachers
2 ,, Solicitors
1 ,, Woolbuyer

APPENDIX 31 CAPITAL, PROFITS AND DIVIDENDS C.S.R. CO. LTD. (*a*)

An historical review (*b*)

Year Ending 31 March	Share Capital Paid-up	Debentures (c)	Profits	Dividends	
				Amount	% p.a.
	£	£	£	£	
1887	See note (a)	—	—	—	—
1888	648,720	901,300	74,062(d)	31,705(d)	6⅔
1889	750,000	836,300	117,962	47,735	7
1890	750,000	836,300	171,472	63,750	8½
1891	1,323,560	446,800	213,655	116,629	9½
1892	1,438,820	348,600	176,158	140,521	10
1893	1,595,450	291,650	188,403	150,327	10
1894	1,637,550	320,550	199,128	161,511	10
1895	1,700,130	466,800	188,082	167,128	10
1896	1,701,370	516,900	170,536	170,066	10
1897	1,702,000	489,250	171,018	170,200	10
1898	1,702,000	434,550	171,027	170,200	10
1899	1,702,000	384,250	170,985	170,200	10
1900	1,786,880	322,950	175,220	174,355	10
1901	1,872,200	269,000	182,982	182,881	10
1902	1,998,580	265,700	194,123	193,387	10
1903	2,000,000	139,800	200,633	199,959	10
1904	2,000,000	139,800	200,713	200,000	10
1905	2,198,400	90,000	276,469	269,313	12½ (e)
1906	2,200,000	65,000	224,369	219,965	10
1907	2,200,000	64,050	222,493	220,000	10
1908	2,495,200	64,050	252,832	234,037	10
1909	2,850,000	64,050	309,126	267,385	10
1910	2,850,000	64,050	344,470	285,000	10
1911	3,000,000	61,850	404,142	292,500	10
1912	3,000,000	61,650	436,431	352,500	11¾
1913	3,000,000	61,650	463,159	375,000	12½
1914	3,250,000	61,650	519,201	406,250	12½
1915	3,250,000	—	529,068	406,250	12½
1916	3,250,000	—	261,251	211,250	6½
1917	3,250,000	—	288,762	211,250	6½
1918	3,250,000	—	279,143	211,250	6½
1919	3,250,000	—	285,427	243,750	7½

APPENDIX 31—*continued*

Year Ending 31 March	Share Capital Paid-up	Debentures (c)	Profits	Dividends	
				Amount	% p.a.
	£	£	£	£	
1920	3,250,000	—	289,565	243,750	7½
1921	2,600,000	—	326,939	260,000	9
1922	2,600,000	—	452,190	284,375	11
1923	2,600,000	—	498,590	325,000	12½
1924	4,875,000	—	673,639	446,875	11½
1925	4,875,000	—	760,653	548,437	11½
1926	4,875,000	—	800,733	609,375	12½
1927	4,875,000	—	832,797	609,375	12½
1928	5,850,000	—	966,628	731,250	12½
1929	5,850,000	—	976,306	731,250	12½
1930	5,850,000	—	910,830	731,250	12½
1931	5,850,000	—	734,823	731,250	12½
1932	5,850,000	—	744,321	731,250	12½
1933	5,850,000	—	792,414	731,250	12½
1934	5,850,000	—	963,501	731,250	12½
1935	11,700,000	—	931,949	731,250	6¼
1936	11,700,000	—	937,980	877,500	7½
1937	11,700,000	—	1,036,336	804,375	6⅞
1938	11,700,000	—	1,060,786	877,500	7½
1939	11,700,000	—	1,005,670	877,500	7½
1940	11,700,000	—	1,103,744	994,500	8½
1941	11,700,000	—	1,054,331	994,500	8½
1942	11,700,000	—	934,619	994,500	8½
1943	11,700,000	—	1,041,601	994,500	8½
1944	11,700,000	—	873,969	994,500	8½
1945	11,700,000	—	881,136	936,000	8
1946	11,700,000	—	887,298	936,000	8
1947	11,700,000	—	1,163,473	994,500	8½
1948	11,700,000	—	1,241,504	1,053,000	9
1949	11,700,000	—	1,206,762	1,228,500	10½
1950	11,700,000	—	1,231,571	1,111,500	9½
1951	12,480,000	—	1,003,402	1,088,100	9
1952	13,260,000	—	1,154,444	1,158,300	9
1953	14,040,000	3,777,100	1,366,394	1,228,500	9
1954	14,040,000	7,000,000	1,417,943	1,263,600	9
1955	14,040,000	7,000,000	1,575,901	1,684,800	12 (f)

Notes:

(a) The Colonial Sugar Refining Company was a partnership of unlimited liability formed on 1 January 1855. On 1 July 1887, with a view to amalgamating with the Victoria Sugar Company, the Colonial Sugar Refining Company Limited was registered with limited liability and paid-up capital of £400,000 in £20 shares paid to £10. Formal amalgamation was effected on 2 August 1887, when paid-up capital was raised to £600,000. 20,000 shares, paid to £10, and £200,000 6 per cent 15-year debentures were issued in payment for assets of Victoria Sugar Co.

(b) In making comparison between, for instance, the capital and profits of the company at different times the changing value of the monetary units employed should be kept in mind.

(c) Debenture stock (held by shareholders) included with debentures until about 1892, by which time all such stock had been applied in paying up the balance due on shares.

(d) Period of 9 months ending 31 March 1888.

(e) For year ended 31 March 1905 the rate of dividend was 10 per cent plus a Jubilee Bonus of 2½ per cent.

(f) For year ended 31 March 1955 the rate of dividend was 9½ per cent plus a Centenary Bonus of 2½ per cent.

1888	4,711 shares paid to £10 and £36,300 6 per cent debentures issued in New Zealand in payment for assets of New Zealand Sugar Co.
	161 shares sold for cash.
	128 shares sold for cash plus premium of £4 each.
1888-89	Paid-up capital increased by £100,000. £50,000 paid out of profit and loss account and £50,000 paid by shareholders.
1890-92	Balance of £10 per share paid by shareholders in cash.
1892-93	Capital increased by £150,000 paid by shareholders in cash.
1894	£52,000 in fully paid shares and £65,000 in 5 per cent 20-year debentures issued in payment for assets of Australasian Sugar Refining Co.
1899-1900	Capital increased by £170,200 paid by shareholders.
1901-2	Capital increased by £127,800. £124,820 paid by shareholders. 149 shares sold for cash.
1904-5	Capital increased by £200,000 paid by shareholders.
1907-8	Capital increased by £300,000. £75,000 paid out of profit and loss account; £225,000 paid by shareholders.
1908	Capital increased by £350,000 transferred from reserves.

1910	Capital increased by £150,000 paid out of profit and loss account.
1913	Capital increased by £250,000 paid out of profit and loss account.
1920	Capital reduced by £650,000 by refund of £4 per share in War Bonds.
1923	Capital restored to £20 per share by payment of £650,000 by liquidator of C.S.R. Co. (Fiji & N.Z.) Ltd.
1924	Capital increased by £1,625,000 out of assets received back from C.S.R. Co. (Fiji & N.Z.) Ltd.
1927	Capital increased by £975,000 paid out of savings.
1934	Capital increased by £5,850,000 paid for: £1,950,000 out of savings and £3,900,000 from revaluation of assets.
1950-2	Capital increased by £2,340,000 (plus premium of £819,000) all paid in by shareholders in cash.
1952-3	Public issues of 5 per cent registered mortgage debentures:—

Redeemable 1959-62	£4,000,000
Redeemable 1960-63	£3,000,000

APPENDIX 32 BALANCE SHEET OF THE COLONIAL SUGAR REFINING COMPANY LIMITED AS AT 31st MARCH 1955

		£
Capital		
Authorized Capital 1,000,000 shares of £20 each	£20,000,000	
Less unissued	5,960,000	
Capital issued and fully paid		14,040,000
Reserves		
Share Premium		819,000
General		1,500,000
Contingency and others		3,511,503
Profit and Loss Account		619,742
Replacement and Depreciation Reserves		13,949,946
Debentures		
5% Registered Mortgage Debentures		
Redeemable 1959-1962		4,000,000
Redeemable 1960-1963		3,000,000
Current Liabilities		
Amounts owing to Subsidiary Companies		1
Employee Debentures		138,670
Sundry Creditors and Provisions		11,111,461
Provision for proposed final dividends and bonus to be paid June, 1955		1,053,000
Contingent Liabilities		
Guaranteed bank overdrafts of subsidiary companies...		
Uncalled capital of subsidiary companies		
		£53,743,323

	£
Fixed Assets	
Sugar Refineries	
Five in Australia, one in New Zealand	10,204,632
Raw Sugar Mills and Transport Plant	
Three in N.S.W., four in Queensland	10,511,260
Five in Fiji	4,888,993
Distilleries in Australia	
One in N.S.W., one in Victoria	1,087,673
Building Materials Factories	
Four in N.S.W.	2,979,312
Pineapple Cannery in Fiji	129,997
Engineering Works, Research Laboratory and Bone Char Factory ...	395,878
Office and Residential Property	318,585
Ocean Vessels	446,589
Investments and Advances	
Investments *less* provision for fluctuation	754,312
Advances to Employees for purchase of homes	791,552
Shares in Subsidiary Companies, *less* provisions	4,074,556
Current Assets	
Working Stocks and Work in Progress, at valuation after providing for possible diminution in value	4,592,838
Stocks of Sugar at valuation	6,483,128
Sundry Debtors, Loans, Advances, etc. after providing for doubtful debts	5,106,927
Amounts owing by Subsidiary Companies	590,697
Cash on hand, or at short call	386,394
	£53,743,323

Assets shown at book value unless otherwise specified.

APPENDIX 33 POSTWAR ECONOMIC PROGRESS IN AUSTRALIA

Being a summary of a survey by Economic Services of Brisbane (Colin Clark and H. W. Herbert) made in January 1955 and especially brought up to date and completed by H. W. Herbert for C.S.R. as at 30 June 1956

The outstanding economic and national achievement in Australia since the war has been the growth of the Australian population—up from 7½ million at the end of 1946 to over 9 million at the end of 1954. Contrary to popular opinion, births have been very much more important in population growth than migrants.

Increase in Australian Population 1947-54 (inclusive)

Births	1,532,000
Net immigration	685,000
	2,217,000
Less deaths	629,000
	1,588,000

Net immigration is excess of arrivals over departures. The "millionth migrant" of 1955 did not allow for departures. In 1955 births will total about 202,000 and net immigration about 110,000.

Australia is well off for children, who temporarily crowd the schools but lessen the proportion of breadwinners. There are approximately 1,000,000 children under 5, against only 600,000 in the 15-19 age group. The latter figure reflects a lower birth rate from a smaller prewar population.

Postwar employment has grown with the population, but unfortunately not uniformly. See graph *Australian Population and Employment 1948-55*.

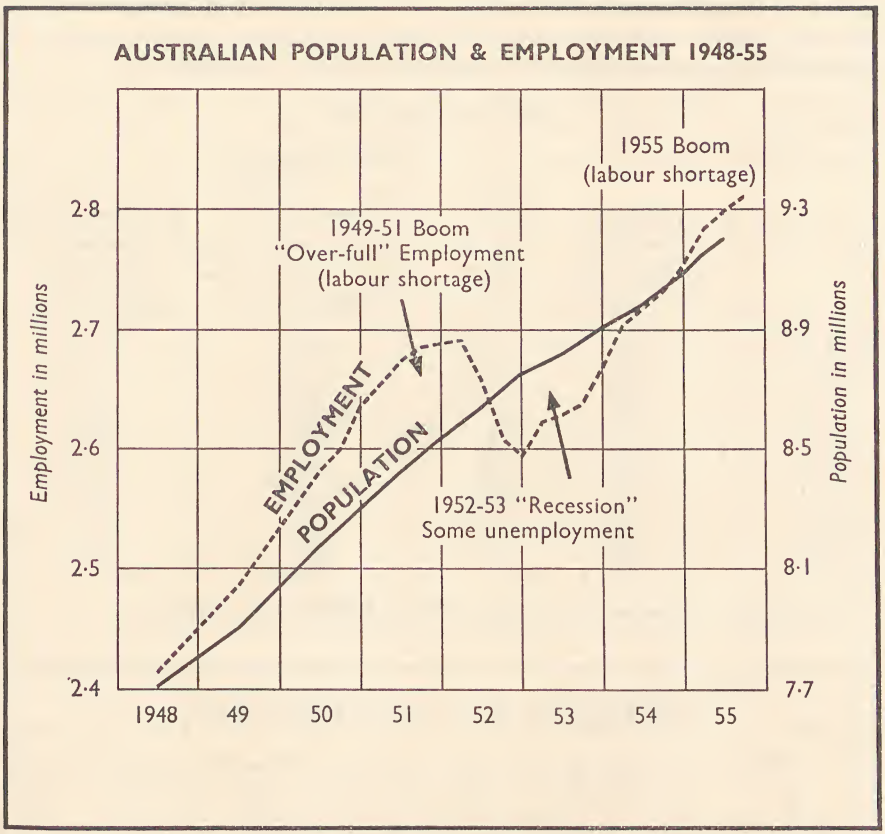
It is a modern political and economic art to maintain full, but not overfull, employment. We have not had much success at this during the last seven years.

What material progress have we made *per head*? Money figures are higher than ever before, but we must make allowance for the population increase and the inflation.

It is our economic position *per head* that determines our standard of living; without higher production per head, higher wages merely help one section of the community at the expense of the others, usually by the process of inflation.

Our economic position and progress is measured by the official National Income figures.

The following table shows the growth of National Income (the sum of all incomes, individual incomes and business net incomes), also population growth.



Money Income per Head

	National Income	Population (31 Dec.)	Money Income per head
	£million	000's	£
1947-8	1759	7638	230
48-9	1950	7793	250
49-50	2283	8046	284
50-1	3115	8308	375
51-2	3259	8528	382
52-3	3588	8740	411
53-4	3842	8903	432
54-5	4033	9091	444

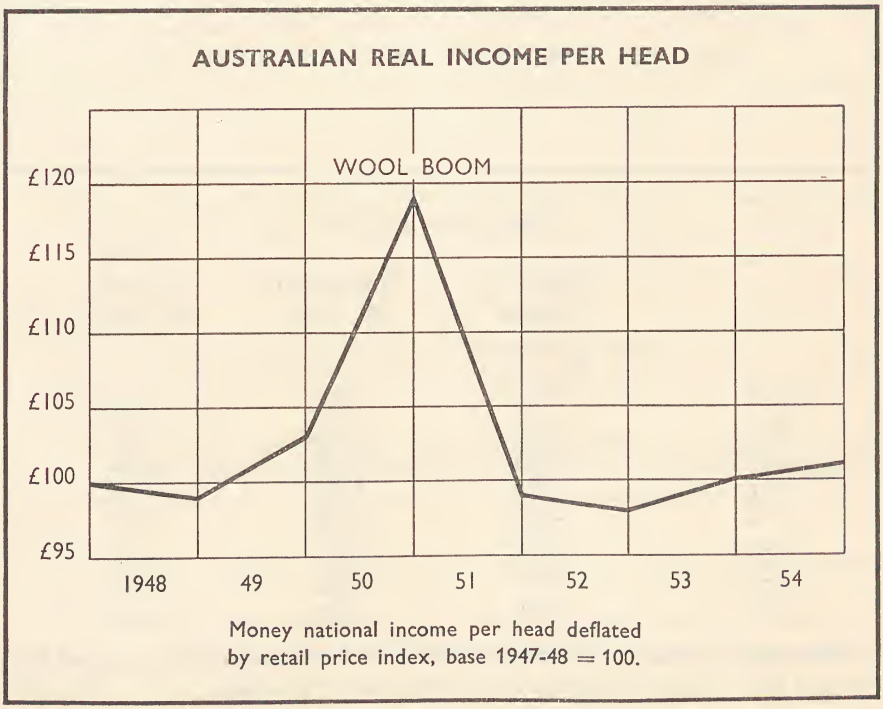
The huge increase in the money National Income can be seen, and also the fact that money income per head has almost doubled.

But during this period the general level of prices has increased by 90 per cent, and to find what the rising money income per head is worth we must deflate the money figures by the rise in prices, as follows:—

Real Income per Head

	Money Income per head £	Retail Price Index 1947-8 =100	Real income per head (i.e. Money income/hd ÷ Retail price index = £ of 1947-8 purchasing power)	Real income/hd converted to the basis 1947-8 = 100
1947-8 ..	230	100	230	100
48-9 ..	250	110	227	99
49-50 ..	284	120	237	103
50-1 ..	375	137	274	120
51-2 ..	382	168	227	99
52-3 ..	411	183	225	98
53-4 ..	432	188	230	100
54-5 ..	444	190	234	102

The graph *Australian Real Income per Head* shows these results.



The discouraging thing about this graph is that the long-term trend shows practically no progress at all in real income per head. This stagnation of real income per head has been obscured by the growth of the Australian population and by the inflation with consequent big money turnovers.

This graph would surprise many Australians; there is a widespread notion that our average standards of living have increased substantially during the postwar period.*

This is not so. What has happened is that the big increase in population and the even bigger increase in money incomes has been wrongly interpreted by many people as evidence of increased real income per head.

Figures are sometimes quoted which show substantial increases in productivity per worker in some section of the economy, such as certain manufacturing industries. They do not, however, cover the whole economy, for which the National Income figures are the only available measure.

In deflating National Income per head by the retail price index it must be remembered that about 75 per cent of the National Income is spent for retail goods (and on rents, which are included in the index). Most of the balance of the National Income is spent on government services, business investment and public works. The cost of these appears to have risen at least as much as the retail price index. (Two of the major components of such expenditure, wholesale basic materials and male wage rates, have risen by 102 per cent and 108 per cent respectively, compared with the retail price rise of 90 per cent.)

Turning now to the comparison between Australia and other countries in growth of real income per head (and using the same method of deflating National Income per head by the rise in retail prices) we find the results shown in the graph *Real Income per Head—Various Countries.*

The relative lack of progress in Australia is striking. We can say that in seven years since 1947-48 real income per head in Australia, although experiencing a temporary increase in the wool boom, has not increased. The figures for Australia are: base 1947-48 = 100; 1954-55 = 102.

Britain, Canada and the U.S. have improved their real income per head at an average rate of about 2 per cent per year while Australia's has shown scarcely any permanent increase.

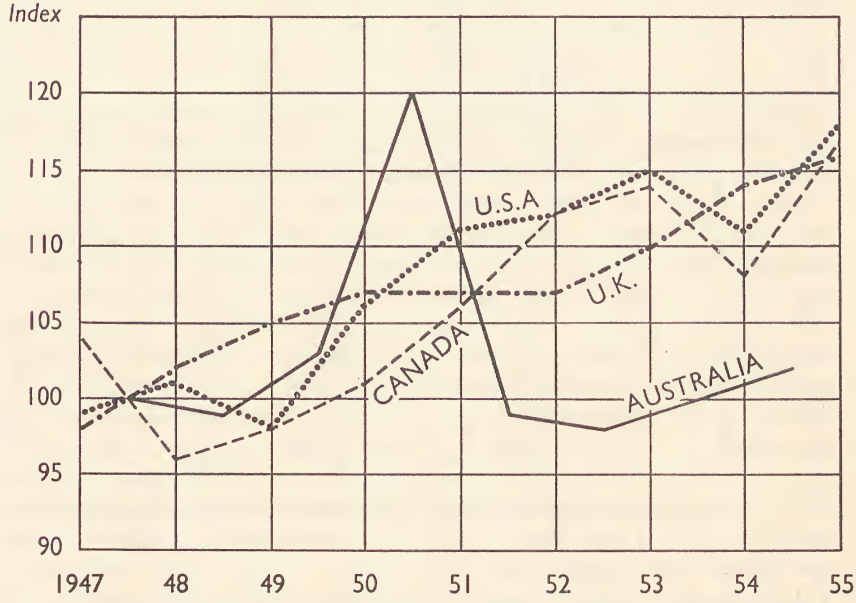
Why is Australia merely marking time?

Is it due to the strain of rapid population growth? This is often suggested, but Canada has had almost the same percentage postwar population increase as Australia, yet has also raised its real income per head.

New Zealand has not done brilliantly but better than Australia, and her rate of population increase has not been far behind Australia's. In 7 years from 1947 to 1954 New Zealand showed an increase in real national income per head, calculated by the same methods as for the other countries, of 1 per cent per annum.

* Various published indices showing increased *production per worker*, but in a limited range of industries, and general statements mistakenly based on these indices, have contributed to the popular belief that Australian real income per head is rising steadily.

REAL INCOME PER HEAD — VARIOUS COUNTRIES

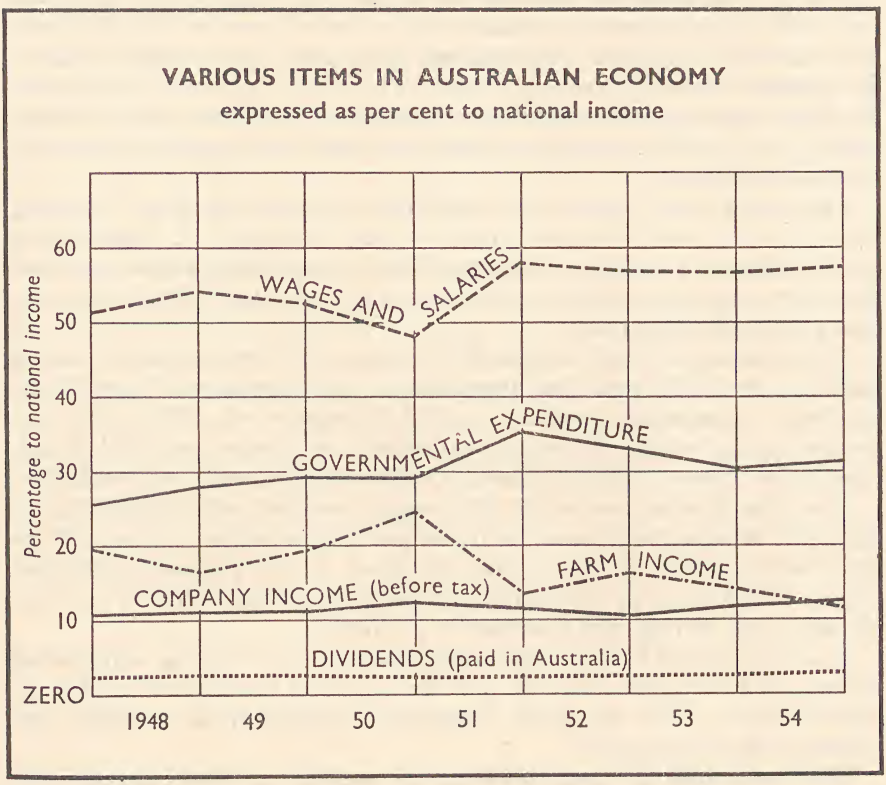


	1947	48	49	50	51	52	53	54	55
AUST.	100	99	103	120	99	98	100	102	
CANADA	104	96	98	101	106	112	114	108	117
U.S.A.	99	101	98	106	111	112	115	111	118
U.K.	98	102	105	107	107	107	110	114	116

U.K. — Gross National Product. Net national income is not published, but the trend of national income appears to be the same as that shown above.

The Australian lack of progress per head (in spite of the increases in output per worker in a number of industries) appears to be due to two main causes. Both are illustrated in the graph *Various Items in Australian Economy.*

Wages and salaries, and governmental spending, have increased their relative importance, and farm incomes have definitely lost ground (farms include non-company graziers). The number of people engaged in farming and grazing has remained almost stationary for the last 7 years while those in non-farm industries have increased by about 15%. But the average production per worker in farming and grazing is much greater than the average production per worker in other industries. Because of the increased proportion of the population in manufacturing and the service industries and the decreased proportion in farming, real income per head has remained



Government expenditure overlaps wages and salaries to some extent, and to a lesser extent other component parts of the national income. National income provides a background for comparison of many items of money income or expenditure, whether they fall completely within the national income or not. Using percentages to the national income deflates for price rises and population growth to a degree which permits valid comparisons, and shows up important social-economic trends, such as the increasing importance in the economy of employees and government. That some of the employees are employees of governments does not invalidate the comparisons.

stationary even though the productivity in many industries has increased slightly.

This relative movement of population away from farming has happened in a number of countries. It has occurred in the United States, but in that country, in contrast to Australia, the production per farmer is much lower than the production per factory and urban worker. Hence every man who transfers from farm to factory in the U.S. means a net gain in production and hence living standards. In Australia the same process has caused a net loss, which has absorbed the small gains in productivity which both rural and non-rural industry have made.

It is a remarkable fact that Australia now has a greater proportion of its working population in manufacturing industry than the United States. Yet Australia's demands for imported goods were never higher. Manufacturing has certainly developed, but without proper regard for its efficiency. We have been hypnotized by the sheer numbers going into manufacturing industry in Australia, whereas we should have been watching the productivity of those industries.

The second main reason why Australian progress per head is lacking arises from the very fact that scarcely anyone in authority in Australia has realized that this progress is lacking. There is one thing worse than lack of progress per head, and that is not to know it, to go along blithely assuming that progress is being made.

This is the mood which has steadily increased social services and expensive public works. As the preceding graph shows, total governmental expenditure has been an increasing percentage of the national income. To pay for this requires an increasing share of a stationary real income per head, which must be got from unwilling citizens as extra taxation, or by more inflation.

The same illusion has led to large wage increases, particularly the £1 per week in 1950, which could only be paid for, in a community with no permanent increase in real income per head, by the process of inflation. This transferred to wage-earners real income from people with fixed incomes, pensions, and savings, and from export producers.

It is this increase in real wages, maintained by cost-of-living adjustments during the subsequent inflation, plus the increased numbers of workers in urban industry, that has given a long-term upward trend to wages and salaries in the graph above.

Inflation is itself the enemy of economic progress. It causes inequity and hardship to some, destroys their savings and securities, yet presents others with windfall profits. Like high taxation, it distracts attention and energy from the vital job of increasing productivity.

It is a common belief that other countries have had just as much post-war inflation as Australia. This is quite incorrect. From 1947-8 to 1955 Australia had twice as much inflation as Britain and more than four times as much as Canada and the U.S. The harmful effect on our economic progress has been correspondingly greater.

What can be done about it?

The volume of production per head in Australia will have to be much improved to allow the upward trend in real income, and hence in living standards for the average Australian, to be resumed. There is plenty of scope for increased productivity per worker particularly in manufacturing industry, where nationally we lag a long way behind North America. High output per employee has been achieved in some Australian industries, and it is a question of extending it much further. It will require more capital equipment and more effective work and skill to do so.

The capital accumulated by company profits plays the most important part in providing additional and improved capital equipment. If profits

are made by increased efficiency, and not by restriction of competition, the bigger they are the better. They provide the savings which both the company and its shareholders can plough back into increased investment. Profitable working also allows the company to employ more training and greater skill on proportionately higher rates of pay. To get big increases in real wages first requires company profits generally to be very good, so that in the whole economy there is a surplus which can be invested in improved plant and equipment for industry. The goose must grow before it can lay golden eggs.

The setback Australia has experienced by the relative decline in importance of primary industries can by degrees be overcome if national policy is directed towards encouraging all high-productivity industries, primary and otherwise. The 20-year-old attitude, stemming from the depression, of fostering industries that can employ a lot of labour has not yet been abandoned. It requires a change in political thinking to value an industry because it requires little, high-earning labour in relation to its production. In Australia, at present, replacing outworn mental attitudes—on the sort of industries we must develop, on wages policy and company profits, on the welfare state—is just as important as replacing outworn capital equipment.

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SOUTH PACIFIC

showing location of Company's activities

Legend

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- Branch Office
- Building Materials Sales Office
- Sugar Refinery
- Raw Sugar Mill
- Distillery
- Building Materials Factory
- Asbestos, Gypsum mine
- Chemical Factory
- Research Laboratories
- Agricultural Experiment Station
- Engineering Workshop
- Training Farm for Fijians
- Cattle Station
- Ships

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